REPORT OF PROCEEDINGS

Conference on Maple Products

November 13-15, 1950

Conference was held at the Eastern Regional Research Laboratory with representatives from interested State Departments of Agriculture, Extension Service, Agricultural Experiment Stations, universities, maple processors and distributors and the United States Department of Agriculture participating.

This report summarizes the discussions of the various speakers during the conference. If further details regarding any particular subject are desired, they may be obtained by writing to the person concerned. See the appended list for names and addresses.

Eastern Regional Research Laboratory
Bureau of Agricultural and Industrial Chemistry
Agricultural Research Administration
U. S. Department of Agriculture
Philadelphia 18, Pennsylvania

PROGRAM

Monday, November 13

10:00 a.m. Objectives of the Conference	P. A. Wells Eastern Regional Research Laboratory

I. REGULATORY PROBLEMS

1. United States Standards for Maple Sirup	E. P. Bostwick Processed Products Standardization and Inspection Division Fruit and Vegetable Branch Production and Marketing Admin. USDA, Washington, D. C.
2. State Inspection and Control of Maple Sirup in New York	S G Duncan Department of Agriculture and Markets Albany, New York
3. Vermont's New Regulatory Law	H. A. Dwinell Division of Markets Department of Agriculture Montpelier, Vermont
4. Regulatory Problems in Canada	Jacques Tardif Division of Chemistry Department of Agriculture Province of Quebec Quebec, Canada

12:30 p.m. Lunch

2:00 p.m.

II. PROBLEMS OF COOPERATIVES

1. The History of the Canadian Cooperative	R. Prefontaine Les Producteurs de Sucre d'Erable de Quebec Levis, Province of Quebec, Canada
2. The New Hampshire Maple Producers' Association	C. A. Lyon Department of Agriculture Bureau of Markets Concord, New Hampshire
3. The Functions and Aims of a Maple Producers' Association	C. N. Smith Vermont Maple Sugar Makers' Association Burlington, Vermont
4. The Maple Industry in Minnesota and Wisconsin	S. A. Holbert Holbert Brothers Onamia, Minnesota
5. The Maple Industry in Michigan	P. W. Robbins Michigan State College East Lansing, Michigan

Tuesday, November 14

9:45 a.m.

III. EQUIPMENT AND PROCESSING PROBLEMS

1. What is New in Maple Sirup Equipment	R. C. Soule Geo. H. Soule Company St. Albans, Vermont
2. Trends in Evaporator Design	R. H. Maroney Vermont Evaporator Company Ogdensburg, New York
3. Problems of the Maple Sirup Processor	Frank Reese United Maple Products, Inc. Burlington, Vermont
4. The Blended Maple Sirup Industry	Hovey Burgess Research and Development Department General Foods Corporation Hoboken, New Jersey

12:30 p.m. Lunch

2:00 p.m.

IV. ROLE OF EXTENSION SERVICE IN AIDING MAPLE PRODUCERS

1. What It Is and How It Operates	C. E. Potter Extension Service U. S. Department of Agriculture Washington, D. C.
2. What the Extension Service Has Done for the Maple Producers in New York	F. E. Winch, Jr. New York State College of Agriculture Cornell University Ithaca, New York
3. Tour of the Laboratory	

Wednesday, November 15

9:45 a.m.

V. RESEARCH PROBLEMS

1. Botanical Research on Maple Sap at the University of Vermont	James W. Marvin University of Vermont and State Agricultural College Burlington, Vermont
2. Variations in Sugar Yield in Maples in Natural Stands	F. H. Taylor University of Vermont and State Agricultural College Burlington, Vermont

3.	The Propagation of Maple Stock	Clark L. Stevens College of Agriculture University of New Hampshire Durham, New Hampshire

12:30 p.m. Lunch

2:00 p.m.

1.	Research Program on Maple Products at Eastern Regional Research Laboratory	C. O. Willits Eastern Regional Research Laboratory
2.	Maple Flavor Studies. A Progress Report	W. L. Porter Eastern Regional Research Laboratory
3.	Development of Permanent Glass Color Standards for Maple Sirup	B. A. Brice Eastern Regional Research Laboratory
4.	Engineering Research Program	E. L. Griffin, Jr. Eastern Regional Research Laboratory

OBJECTIVES OF THE CONFERENCE

by

P. A. Wells, Eastern Regional Research Laboratory

The meeting was opened by Dr. Wells, who explained the background and purpose in organizing the industry-wide conference on maple products. He explained that the first step in the planning took place early last March at the annual meeting of the Experiment Station Directors of the Eastern Area. At that time the subject of the conference was agreed upon. Directors of Experiment Stations in the various Northeastern States where a maple industry exists were urged to recommend as collaborators for this year persons who had a background and interest in maple products. In addition to representation from the Experiment Stations, participation by other agencies of the Department of Agriculture and by University and Extension Service personnel in all maple producing states was sought. In order to bring together all segments of the industry invitations were likewise sent to maple producers, processors, equipment manufacturers, distributors and other interested groups.

Dr. Wells pointed out that although the program illustrated very well the purpose of the meeting he hoped that the associations formed and the informal discussions held on problems of mutual interest would be of even greater value than the formal papers.

UNITED STATES STANDARDS FOR MAPLE SIRUP

by

E. P. Bostwick, Production and Marketing Administration, U.S.D.A.

This agency of the Department of Agriculture has issued over one hundred standards for fruits, vegetables, and special products. An attempt has been made to develop a common nomenclature in grade designation. United States Standards for Table Maple Sirup and for Maple Sirup for Reprocessing were issued in 1940. A revision of these standards is being proposed by the Department. A preliminary draft of the proposed revision was read at the conference. The final proposed revision will shortly be available in mimeographed form for distribution. Comments of interested persons on these proposals are invited and should be addressed to the above agency. After these comments have been considered, the revised standards will be published in the Federal Register as a notice of proposed rule making. Further comments of the industry are then invited. All relevant data are considered before the revised standards are again published in the Federal Register to become effective within 30 days of such publication.

The preliminary draft of the proposed revision is reproduced as follows (Table II, containing data on refractive indices, soluble solids, specific gravity, etc., is omitted):

PROPOSED REVISION OF
UNITED STATES STANDARDS FOR GRADES OF MAPLE SIRUP
WHICH HAVE BEEN IN EFFECT SINCE FEBRUARY 15, 1940 1/, 2/

The proposed revision is as follows:

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s 52.438 Maple sirup. Maple sirup is the sirup made by the evaporation of maple sap or by the solution of maple sugar (maple concrete), and is prepared and packed in accordance with good commercial practice.

(a) Color of maple sirup. The color of maple sirup is not a factor of quality for the purpose of these grades. The color classification of maple sirup is determined by means of the U.S.D.A. color standards for maple sirup. The color designation of maple sirup and range for each color is shown in Table No. 1 of this section.

(b) Tolerance for certification of color of officially drawn samples. (1) When certifying the color of samples that have been officially drawn and which represent a specific lot of maple sirup, the lot shall be considered as of one color if not more than one-sixth of the containers comprising the sample contains maple sirup of a different color; provided, however, that the maple sirup in none of the containers falls below the next darker color designation.

Table No. 1

Color designation of maple sirup and range for each color

U.S.D.A. Color Standards	Color Range U.S.D.A. Color Standards
Light Amber	Maple sirup that is Light Amber or lighter in color than Light Amber Color Standard
Medium Amber	Maple sirup that is darker than Light Amber but not darker than Medium Amber Color Standard
Dark Amber	Maple sirup that is darker than Medium Amber Color Standard but not darker than Dark Amber Color Standard

(c) Recommended fill of container. The recommended fill of container is not incorporated in the grades of the finished product since fill of container, as such, is not a factor of quality for the purpose of these grades. It is recommended that each container be filled with maple sirup as full as practicable, and with respect to containers of 1 gallon or less the maple sirup shall occupy not less than 93 percent of the total capacity of the container.

1/ The requirements of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act.

2/ These grades have been so drafted that they may be used in grading blends of maple sirup and sirup made from sugar and maple sugar sirup.

(d) Grades of maple sirup. (1) "U. S. Grade A" or "U. S. Fancy" is the quality of maple sirup that contains not less than 65 percent soluble solids[3/], possesses a good flavor, is practically free from defects, is practically clear, and scores not less than 90 points when scored in accordance with the scoring system outlined herein.

(2) "U. S. Grade B" or "U. S. Choice" is the quality of maple sirup that contains not less than 65 percent soluble solids[3/], possesses a reasonably good flavor, is reasonably free from defects, is reasonably clear, and scores not less than 80 points when scored in accordance with the scoring system outlined herein.

(3) "U. S. Grade C" or "U. S. Standard" is maple sirup for reprocessing that contains not less than 65 percent soluble solids[3/], possesses a fairly good flavor, is fairly free from defects, and is of such quality with respect to clarity as to score not less than 70 points when scored in accordance with the scoring system outlined herein.

(4) "U. S. Grade D" or "Substandard" is the quality of maple sirup that fails to meet the requirements of "U. S. Grade C" or "U. S. Standard".

(e) Ascertaining the grade. (1) The grade of maple sirup is ascertained by considering in conjunction with the other requirements of the respective grade, the respective ratings of the factors of flavor, absence of defects, and clarity.

(2) The soluble solids content of maple sirup means the soluble solids as determined by means of the refractometer at 20 degrees C. (68 degrees F.) The refractive indices and corresponding percent soluble solids and equivalent specific gravity and percent moisture may be ascertained from Table No. II of this section. The soluble solids content of maple sirup and equivalent values may be determined by any other method which gives equivalent results.

(3) The relative importance of each factor which is scored is expressed numerically on a scale of 100. The maximum number of points that may be given each such factor is:

Factors		Points
(i)	Flavor	40
(ii)	Absence of defects	30
(iii)	Clarity	30
	Total score	100

(4) Partially crystallized maple sirup shall be liquefied by heating to approximately 130 degrees F. and cooled to approximately 20 degrees C. (68 degrees F.) before ascertaining the grade of the product.

(f) Ascertaining the rating for each factor. The essential variations within each factor are so described that the value may be ascertained for each factor and expressed numerically. The numerical range for the rating of each factor is inclusive (for example, "24 to 26 points" means 24, 25, or 26 points).

(1) Flavor. (i) Maple sirup that possesses a good flavor may be given a score of 36 to 40 points. "Good flavor" means a good characteristic maple sirup flavor and that such maple sirup is free from objectionable flavor

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3/ Percent soluble solids and other equivalents may be ascertained from Table No. II of this section.

including but not limited to objectionable flavors caused by scorching, buddy or fermented sirup or any foreign or disagreeable flavor or odor.

(ii) If the maple sirup possesses a reasonably good flavor a score of 32 to 35 points may be given. Maple sirup that falls into this classification shall not be graded above "U. S. Grade B" or "U. S. Choice" regardless of the total score for the product (this is a limiting rule). "Reasonably good flavor" means a reasonably good characteristic maple sirup flavor and that such maple sirup is free from objectionable flavor including but not limited to objectionable flavors caused by scorching, buddy or fermented sirup or any foreign or disagreeable flavor or odor.

(iii) Maple sirup that possesses a fairly good flavor may be given a score of 28 to 31 points. Maple sirup that falls into this classification shall not be graded above "U. S. Grade C" or "U. S. Standard" regardless of the total score for the product (this is a limiting rule). "Fairly good flavor" means a fairly good maple sirup flavor and such maple sirup may possess a slightly carmelized or buddy sirup flavor, is free from objectionable flavor, including but not limited to objectionable flavors caused by fermentation or any foreign or disagreeable flavor or odor, and may possess not more than a slightly objectionable flavor from other causes.

(iv) Maple sirup that fails to meet the requirements of subdivision (iii) of this subparagraph or is off flavor for any reason may be given a score of 0 to 27 points and shall not be graded above "U. S. Grade D" or "Substandard" regardless of the total score for the product (this is a limiting rule).

(2) Absence of defects. The factor of absence of defects refers to the degree of cleanliness and to the degree of freedom from extraneous material such as pieces of bark, soot, or any particles of earthy material or other defects which may be in suspension or deposited as sediment in the container.

(i) Maple sirup that is practically free from defects may be given a score of 27 to 30 points. "Practically free from defects" means that any defects which may be present do not affect the appearance or edibility of the product.

(ii) If the maple sirup is reasonably free from defects a score of 24 to 26 points may be given. Maple sirup that falls into this classification shall not be graded above "U. S. Grade B" or "U. S. Choice" regardless of the total score for the product (this is a limiting rule). "Reasonably free from defects" means that the maple sirup may contain defects which do not materially affect the appearance or edibility of the product.

(iii) Maple sirup that is fairly free from defects may be given a score of 21 to 23 points. Maple sirup that falls into this classification shall not be graded above "U. S. Grade C" or "U. S. Standard" regardless of the total score for the product (this is a limiting rule). "Fairly free from defects" means that the maple sirup may contain defects which may materially but do not seriously affect the appearance or edibility of the product.

(iv) Maple sirup that fails to meet the requirements of subdivision (iii) of this subparagraph may be given a score of 0 to 20 points and shall not be graded above "U. S. Grade D" or "Substandard" regardless of the total score for the product (this is a limiting rule).

(3) Clarity. The factor of clarity has reference to the degree of freedom from fine particles of mineral matter such as malate of lime, "nitre," "sugar sand," or of any suspended material that may affect the clearness of the maple sirup.

(i) Maple sirup that is practically clear may be given a score of 27 to 30 points. "Practically clear" means that the maple sirup may contain not more than a trace of finely divided particles of suspended material which does not affect the appearance of the product.

(ii) If the maple sirup is reasonably clear a score of 24 to 26 points may be given. "Reasonably clear" means that the maple sirup may contain finely divided particles of suspended material which does not materially affect the appearance of the product.

(iii) Maple sirup that is fairly clear may be given a score of 21 to 23 points. Maple sirup that falls into this classification shall not be graded above "U. S. Grade C" or "U. S. Standard" regardless of the total score for the product (this is a limiting rule). "Fairly clear" means that the appearance of the maple sirup may be materially but not seriously affected by the presence of finely divided particles of suspended material.

(iv) Maple sirup that fails to meet the requirements of subdivision (iii) of this subparagraph may be given a score of 0 to 20 points and shall not be graded above "U. S. GradeD" or "Substandard" regardless of the total score for the product (this is a limiting rule).

(g) Tolerances for certification of officially drawn samples. (1) When certifying samples that have been officially drawn and which represent a specific lot of maple sirup, the grade for such lot will be determined by averaging the total scores of all the containers comprising the sample, if:

(i) Not more than one-sixth of such containers fails to meet all the requirements of the grade indicated by the average of such total scores, and with respect to such containers which fail to meet the requirements of the indicated grade by reason of a limiting rule, the average score of all containers in the sample for the factor, subject to such limiting rule, must be within the range for the grade indicated;

(ii) None of the containers comprising the sample falls more than 4 points below the minimum score for the grade indicated by the average of the total scores; and

(iii) All the containers comprising the sample meet all applicable standards of quality promulgated under the Federal Food, Drug, and Cosmetic Act and in effect at the time of the aforesaid certification.

(h) Score sheet for maple sirup.

Size and kind of container			
Container mark or identification			
Label			
Net weight (ounces)			
Soluble solids (percent)			
Moisture (percent)			
Specific gravity			
Factors		Score points	
I. Flavor	40	(A) 36-40 (B) 32-35 1/ (C) 28-31 1/ (D) 0-27 1/	
II. Absence of defects	30	(A) 27-30 (B) 24-26 1/ (C) 21-23 1/ (D) 0-20 1/	
III. Clarity	30	(A) 27-30 (B) 24-26 (C) 21-23 1/ (D) 0-20 1/	
Total score	100		
Grade			
Color			

1/ Indicates limiting rule within classification.

Discussion

Q. Am I to understand from these proposals that color is no longer to be considered a factor of quality in the grading of maple sirup?

A. Yes, that is correct. The classification of the color of the sirup is provided for, but it is not evaluated as a quality factor. The scoring of the quality factors in the manner prescribed in the proposed standards determines the grade of the product.

Q. It is stated that a certain score is required in order for a sirup to meet a certain grade. For example, U. S. Grade B must have a total score of at least 80 points. Is it possible for a sirup to have a total score of 80 but be classified in a lower grade because one element (say the flavor) received a lower score?

A. The total score must be not less than 80 points in this case to be eligible for Grade B or Choice, and in addition, the scores for flavor, absence of defects, and clarity must fall within the prescribed range for this grade.

Q. What is the purpose of classifying the color of maple sirup?

A. In order to give freedom of choice to buyer and seller and also to satisfy the preferences of customers or as an aid in blending and processing.

Q. The proposed standards seem to be similar to those proposed for honey. This seems radical. Is quick adoption of the proposals planned?

A. The comments of the industry are invited. The publication of the proposed standards in the Federal Register as a notice of rule making will follow within a reasonable time with further opportunity for comment. These standards are not mandatory but are for the optional use of the industry.

Q. Will any distinction be made between processed sirup and sap sirup?

A. The standards as now written may be applied to blends as well as to pure maple sirups.

Q. Will the proposed Federal standards conflict with State regulations?

A. They would conflict with State grade standards and regulations where such standards base the grade on color.

Q. Is there any organization in the maple industry to present comments on such proposals for the industry as a whole? Is it possible that a committee or group representing the industry could assist in bringing up such suggestions?

A. The Department would welcome suggestions for establishing such a group or committee. It is at present customary to obtain the views of individual members of the industry representing producers and distributors, and of State departments of agriculture, and to study consumer preferences.

Q. Will the proposed standards permit labeling without color designation? Will they apply to blends as well as to pure maple sirups?

A. The color designation may be included in the label statement in addition to the U. S. grade if desired. Both are optional. The standards as proposed may be used for grading blends as well as for grading pure maple sirup. The use of the grade standards is not mandatory. Regulatory problems such as labeling requirements on sirups shipped in interstate commerce fall within the province of the Federal Security Agency, Food and Drug Administration. The proposed standards if made effective will eventually become a part of the Federal Specifications for the purchase of sirup by military and other government agencies.

Q. Are there any specifications for strength of flavor?

A. Not directly. Light amber maple sap sirup may have a more delicate or milder flavor than a darker sirup. Either would be eligible for a high score for flavor if each is fully characteristic and is free from any objectionable flavor or odor of any kind.

(Comment by S. A. Holbert of Minnesota: From the point of view of the Western States the proposed system is an improvement over the present Federal system. Our market prefers a darker color and a higher flavor, and under the present system such sirups receive a lower grade. This is inconsistent because such products are actually of high grade.)

STATE INSPECTION AND CONTROL OF MAPLE SIRUP IN NEW YORK STATE

by

Spencer G. Duncan, Department of Agriculture and Markets, Albany, New York
(Read by R. E. Lothrop, Eastern Regional Research Laboratory)

Prior to 1938, the maple industry in New York State was operating on a control-free basis except for enforcement of such Pure Food and Drug regulations as were in effect at that time.

There was much complaint on the part of handlers that some buyers, in short years, were favoring certain producers at the expense of other producers. On several occasions, it was reported to the Department that as much as 1 cent a pound bonus was being paid to certain large producers in order to obtain sirup which otherwise might have been sold to a competing buyer. In those days, most of the sirup was purchased by processors, loaded in the cars, shipped to the processing plant and there refined and converted into maple products.

The maple producers, sensing the results that such a method of buying would eventually have on their industry, appealed to the State Legislature for a law that would require all dealers to register and specify that all sirup purchased by dealers must be purchased on the basis of official grades and paid for on the basis of the grade as established by the Inspector.

With the passage of this law, came a demand for maple grading sets to be used by producers and buyers in determining grade. The production of these sets was undertaken by the State chemist who was at that time working in a laboratory at the College of Agriculture. The sets sold at a nominal price and were well received by producers and buyers. They were made up on the basis of official color standards obtained from the U. S. Department of Agriculture. Matching our sets with those furnished by the Washington office was no easy matter and consumed a

great deal of time badly needed for other activities. When it became necessary to close the Ithaca laboratory, the preparation of the grading sets was transferred from Ithaca to the Albany laboratory. Since that time, much headway has been made in developing ways and means of measuring and accurately matching color sets distributed by the Department.

Because of the ever-present possibility that the caramel-glycerin combinations might vary somewhat for many reasons, an improved standard was sought. Through the efforts of Dr. A. H. Robertson, Director of the Department's Food Laboratory, the matter of producing a permanent maple grading set was discussed with officials of the U. S. Department of Agriculture. The latter agency undertook the development of permanent glass color standards and arranged for making them available commercially. A description of them has been included in our 1949-1950 annual report.

The assistance that the Inspection Service has received from our Food Laboratory helped tremendously in carrying on the inspection work in New York State. As for inspection prior to World War II, practically all commercial shipments of sirup for processing were officially inspected and certificates issued to the producer and buyer. This inspection required the services of eight to ten inspectors each year for a period of from three to five weeks and came at a time of year when inspectors were readily available.

During World War II when price controls were adopted, practically all of the good quality maple sirup was sold directly to consumers, leaving for the most part, only the poorer grades for sale to wholesale buyers. Because of the comparatively small volume offered to dealers by producers, the cost of inspection seemed prohibitive and very little inspection work was carried on during those trying years.

Conversion from a wartime to a peacetime economy was slow, especially for maple producers and buyers, since volume was materially reduced through the cutting of maple groves and by the change in transportation methods. When inspection was first started, most of the maple sirup was transported by rail. Since the war, most of the volume has been shifted to trucks which roam the countryside, picking up sirup direct from the producers and hauling it to the processing plant. These changes present an inspection problem which cannot readily be overcome and which may defeat the purpose of the original maple grading act. As a result of these changes, very little inspection work was carried on during the 1949-1950 season and there is little prospect that increased volume can be expected in the near future.

The Department wishes to do everything it can to facilitate the movement of maple products for New York producers and will willingly consider any plan for future improvement.

In addition to the aforementioned maple activities, the Department is charged with the responsibility of enforcing the Pure Food Law. Each season, Regulatory Inspectors check hundreds of samples of maple sirup for adulteration, misbranding or incomplete labeling. When maple products are selling at high prices, there are always those who would deceive the public by mixing cane sugar sirup with maple sirup in an amount that makes it a very profitable enterprise, providing they escape the notice of the Regulatory Inspectors.

Dealers merchandising pure maple could be very helpful by reporting all suspicious transactions to the Bureau of Food Control in the Department of Agriculture and Markets.

Discussion

Q. I should like to ask, particularly of the New York and Vermont representatives, whether the terms "Light Amber," "Medium Amber," and "Dark Amber" are in common usage to describe the color grades. If not, has use of the new comparators with these lettered designations introduced any confusion?

A. The grade designations in these states have been "Fancy," "No. 1," "No. 2," and "No. 3," and these terms commonly refer to the color. However, in the new Vermont grading law the Vermont grades are designated Fancy, Grade A, Grade B; and Grade C, and the color limits for these grades are described in terms of the U. S. color standards light amber, medium amber, and dark amber. The new permanent glass standards are not yet in wide use, and there is no report of confusion.

VERMONT'S NEW REGULATORY LAW

by
H. A. Dwinell, State Department of Agriculture, Montpelier, Vt.

I am quite sure that there is no need of enumerating for anyone in this group the general conditions in the maple industry which individually or collectively may have lead to the enactment of the Vermont's regulatory law. It is commonly known, I'm sure, that maple products are in the luxury class and that the industry from the standpoint of number of trees tapped, number of operators and production has been declining for many years. Everyone is aware too, I'm sure, that costs of production and values have risen abruptly in recent years, and that the increased prices still are not sufficient to hold or increase the number of operators. If any of you ever lived on farms where maple sirup was made you well appreciate the fact that the old rule of thumb - a gallon of sirup to pay for a day's wage for help in sugaring - is no longer possible.

During the same recent years the northeast has seen a tremendous development in the tourist traffic. Vermont's visitors during the year doubtless approaches two million. During the summer months, June to October, this year over 125,000 tourists registered at the state owned and private information booths. Vermont is an important gateway into New England and into Canada, and for Canadians moving south. Probably not over one in 15-20 of the people passing through Vermont register. A large majority of the tourists coming or passing through Vermont desire to purchase and take home with them supplies of Vermont maple. Because of this demand sales places have multiplied. Practically every public business place which tourists might contact, during the summer at least, now sells one or more kinds of maple products. It is likely that many of the tourists are individuals who in the days of white sugar rationing quite frantically wrote to Vermont and other states as well seeking a source of sweetening and developed a liking for maple. Direct to consumer traffic in maple products doubtless was enhanced all over the country. There are an estimated 7500 people involved in the selling of maple products in Vermont. This includes most of the estimated 4500 producers, some 1500 to 2000 retail grocery stores and roadside stands, and a large number of gas station operators, drug stores, news stands, hotels, restaurants, garages, barber shops and itinerant peddlers.

So we have the situation of a decreasing supply and an increasing potential market, or at least outlets desiring to sell, but with the incentive for increased production still lacking. Of course for those who seek to buy maple

sirup as an item in their grocery store the blends and substitutes now available in almost countless brands most readily are available.

There just isn't pure maple of high quality sufficient to compete and the price is too high anyway. The short crops as in the past few years have made matters still worse.

It is easy to guess what happens under such circumstances. It is a fact as well as a boast that the name Vermont Pure Maple Sirup is nationally known. Possibly it is also nationally used. Everybody wants to capitalize on a good thing.

Now Vermonters can well be proud of its maple industry and the individuals and concerns generally who are responsible. In general goods that are high to excellent in quality are being packed. I feel very sure the most compelling urge towards enactment of a controlling law was the desire for protection for the bonafide and established producers, packers and handlers. I believe the one most convincing incident which turned the urge into action was a display presented at a series of maple meetings three years ago. The display consisted of a number of samples of sirup in glass which the established producers and packers were using for competition.

Now the idea of laws to protect the maple industry in Vermont is not new. In fact some of the earliest records of Vermont agriculture reveal that speakers at farm institutes repeatedly proclaimed the need for protecting the pure maple products of high quality from the competition of low grade goods and one of the earliest agricultural laws enacted in Vermont was to provide protection to the purity. Considerable thought and discussion was given to the matter well in advance. At least four years before the enactment of the present law the idea was discussed at regional meetings held throughout the state. Both state-wide and county meetings of the sugar makers association endorsed the idea. Hon. E. W. Gibson, then Governor, gave sympathetic support and urged the legislature to take action.

The law enacted is not a new type of law. It is similar in pattern to the branding laws already in effect on a number of products in the country and perhaps especially in the northeast.

The fresh egg laws, the Maine potato branding law, the New Hampshire potato branding law, the compulsory grading laws on apples in nearly every northeast state are other examples. Various agricultural industries have shown definite inclination towards supporting this kind of control.

Naturally some differences of opinion existed as to what should be included in the maple law. There were some who desired that an industry tax should be included. Others wanted more controls. A few wanted compulsory inspection. Because of these differences and a few late additions what come out of the legislation spout didn't look exactly like what went into the hopper, or even what had been considered. I am not suggesting that standardization of the entire output of the state into one or even a few packs is wholly desirable. There likely will always be a consumer demand for the farm packed sirup. But other than the product packed by the processing distributors there was very little uniformity to the product offered to the public by the 7500 or so sellers.

(Abstractor's Note: Mr. Dwinell at this point read portions of the law. The following is a quote of Section 1 on page 3 of the Maple Grading Law of 1949. Copies of Circular No. 14 may be obtained by writing to:

Division of Markets
Vermont Department of Agriculture
Montpelier, Vermont.

"Section 1. Every shipment, package or container of maple sirup, packed, sold, offered or exposed for sale or distribution in the State by any person shall be plainly and conspicuously marked: (1) with the name and address of the packer together with the producer's or packer's seal in such form as approved by the Commissioner of Agriculture on the cap of the container which must be so affixed that the container cannot be opened until such seal is broken; (2) the true name of the product and the year of manufacture; (3) the grade and (4) the contents of the container. Any markings which indicate pure Vermont maple sirup shall be used exclusively on pure maple sirup produced within the State of Vermont."

Mr. Dwinell then displayed approved types of seals. He indicated that it was too early at this time to measure the results of the law.)

In general the attitude has been very favorable by producers and packers alike. It is evident that knowledge and understanding of grades and grading greatly increased. Some 3000 color grading sets were distributed compared with about 800 in previous years. Seven hundred and two hydrometers were sold as compared with 174 average for previous seasons.

One million two hundred paper seals were distributed. In addition 453 identification marks were issued.

Naturally no such law is free from defects. Some changes or deletions may be necessary to insure best results. Some features may be impracticable and unenforcible. Some features may be more of a nuisance than otherwise.

I am sure no one considers this law a panacea for the industry. Other steps by the industry may be necessary to make possible the greatest protection to the heritage which the Vermont maple industry has in the name Vermont Pure Maple.

Discussion

Q. Were the mechanical seals designed by the state?

A. No.

Q. When are the paper seals used?

A. By those who do not have or do not want to use the commercial seals.

Q. What is on the paper seals?

A. Just an identification of the producer who uses it. The seal prevents a packer from removing or changing the contents after grading.

Q. On page 10 of the grading law, it is asked, "Does the grading law require that all maple sirup be officially inspected?" and "Will the department check the grade of sirup being packed before sealing for packers or producers?" How can you enforce a law which does not require inspection?

A. Only check inspections are made by the state.

Q. What is your feeling about not using color as a standard for grading?

A. The color seems to be the best way for a purchaser to tell what he is getting.

Q. Do you see any changes which may have to be made in the new law?

A. Only the year of manufacture and it is possible that the seal portion of the law may have to be reviewed.

REGULATORY PROBLEMS IN CANADA

by

Jacques Tardif, Department of Agriculture, Province of Quebec

In the Province of Quebec, three laws are enforced on maple sirup; in the other Provinces, only two. The reason we have a special law is due to the fact that the Province of Quebec is producing 81 percent of the total Canadian production. In 1949, 21,236,000 trees were tapped. We had then over 25,000 producers and our annual production varies between 25,000,000 and 30,000,000 pounds of sugar.

The Laws

(1) The Pure Food and Drug Act, administered by the National Health and Welfare Department, Ottawa, Canada, is a federal law. Its two fundamental principles are:

(a) That no injurious substance shall be mixed with articles to be used for food, and that drugs shall have nothing added to them to reduce their quality or strength;

(b) That no misrepresentation shall be made concerning the nature of either drugs or foods. The former principle deals with adulteration; the latter with misbranding. The purpose of this law is to force all impure foods off the market, leaving room for only those that are pure, wholesome and harmless.

(2) The Maple Products Industry Act and Regulations, administered by the Dominion Department of Agriculture, Marketing Service, Fruit and Vegetable Division, Ottawa. It is a federal law controlling, all over Canada, the production, processing, grading, packing, labelling, sale inter or intra Canadian provinces, exportations, issue of licenses or permits for shipment or transportation of maple products out of the provinces or out of Canada, registration of manufacturers or packers, etc.

(3) The third law, which is a provincial law, is entitled Act and Regulations concerning the Grading and Sales of Maple Products. This Act may be cited as Agricultural Products Act. "Agricultural products," within the meaning of this Act, signify any produce of animal or vegetable origin, with the exception of canned foods governed by the Canned Foods Act (Chap. 140), and except aquatic animals. R. S. 1925, c. 68B, s. 2; 25-26 Geo. V. c. 30, s. 1.

As you are aware, an amendment to the Federal or Provincial Acts can be made only by the presentation of a bill at the House of Commons or the Legislative Assembly, respectively. The regulations, however, can be amended by an Order in Council and the amendment becomes effective at the date of its publication in the Canada

Gazette (Federal regulations) or The Quebec Official Gazette (Provincial regulations).

Last Spring, at a conference held in Montreal and attended by many representatives of the American buyers and packers, a few resolutions were moved, but not carried on, because we were, at the time, too close to the end of the Parliament session. Those resolutions were in the order of amendments to the law. We believe, however, that they will be presented this year at our coming session and enforced next year.

As the title of our provincial law implies, it concerns the grading and sale of maple products only. It has no jurisdiction on the production. This is left to the officers of the Federal laws.

The minister of Agriculture of the Province of Quebec is charged with the carrying out of this Act. Being a provincial Act, its enforcement is limited to commerce carried out within the Province of Quebec.

Through a close collaboration of the superior officers and inspectors of the three Acts, every angle of the maple sugar industry, from the production, grading, labelling, sale, seizure of unwholesome or adulterated products, etc., is covered.

Furthermore, some of the provincial inspectors are authorized by the Federal Government to act as federal representatives, with the power of enforcing the Federal Act and Regulations and vice versa.

Grading

The classification of maple sirup in the Province of Quebec is based on the caramel glycerine standard colors, called "Colorimeter." In March 1943, a four-grade colorimeter was issued jointly by the Federal and Provincial Departments of Agriculture. It did not give a fair deal to the quality produced by the majority of Canadian farmers, and too great a percentage of a fine quality of sirup was classified as "Dark." That is why it was modified this year into a five-grade colorimeter by Order in Council, March 16, 1950. The 1950 crop has been grading accordingly.

You may be interested in knowing how we obtained these definite caramel-glycerine standards. It was through an application of the Balch method (Industrial and Engineering Chemistry, Vol. 22, pp. 255-257, 1930), using however, the Coleman Spectrophotometer Model 11, at the wave-length of 560 mμ, temperature 20° C., with a 1.9 cm cell. Each reading, expressed in percent of light transmission, corresponds to the minimum of each grade:

Canada	Fancy	AA	gives	70
"	Light	A	"	50
"	Medium	B	"	30
"	Amber	C	"	15
"	Dark	D	"	14 down

We duplicated the standards prepared by the Provincial Government Official Grader, Mr. Napoleon Rompre, which standards had been accepted by the Board of Directors of the Coopérative des Producteurs de Sucre, of Plessisville, Quebec.

This colorimeter is distributed to the farmers by the Quebec Department of Agriculture for the price of $0.25; to processors, manufacturers and others for the price of $1.00.

It varies, so it must be changed every second year. The year of issue being stamped underneath with the wording "Void after.....(such a year)".

I will not read to you a definition of the five grades, but I believe you will be interested in hearing our wording for one of them: Canada Fancy (AA) for instance:

(Art. 18, a) Maple sirup having the following characteristics: "Very light amber" colour and represented at a minimum by the standard colour of the 1950 Official Quebec Colorimeter, shall weigh 13 pounds and 2 ounces per Imperial gallon, shall include a minimum of 65% of total solids determined by refractometer or Brix densimeter at 68° F. or 31-1/2° Beaumé at 60° F.; mild characteristic maple flavour, free from any trace of fermentation and without alterations of any kind whatsoever giving the sirup a taste other than maple flavour.

You will notice that there is nothing in this definition covering turbidity of a sirup, but in the General Provisions of the Regulations, Art. 2, item "H", we read: "Limpidity" means that maple sirup must be cleared of any dirt, or malate of calcium ("dreg"), or of any other matter prejudicial to the transparency of maple sirup.

Should a sirup answer all the specifications of a grade except for its limpidity, it is graded in the next best grade. For instance, from Fancy it goes down to Canada Light.

Compulsory Grading

It is compulsory to grade any maple product in the Province of Quebec. Art. 5 says: "The grading of maple products is compulsory, and must be carried out either by the grader or the vendor, according to the following provisions."

I would also like to draw your attention to the word "Maple". Unless explicitly mentioned, it is forbidden to hold or ship for selling purposes, to place on sale or sell under any appellation whatever which contains the word maple or any other expression bringing to mind this product, a commodity prepared for the same use as a maple product and not deriving exclusively from maple sap (Art. 15, title 3).

Sale

Art. 8. Any buyer of maple products in the Province of Quebec, shall, during the month of February of each year, register at the Department of Agriculture of Quebec, Apiculture and Maple Sugar Branch, on a form furnished by the Department.

Art. 9. In cases provided for in section 7 of these regulations, the buyer cannot take possession of the goods, personally or through his agent, without having had same previously graded by the grader. This obligation is incumbent upon the buyer and, if he fails to fulfill it, this constitutes an infraction against the provisions of these regulations.

Art. 10. During his operations, the grader shall draw up a grading report in triplicate, one copy of which he shall remit to the buyer or his authorized representative, another to the vendor or his authorized representative, and the third to the Department of Agriculture.

Whenever requested to do so by the vendor or the buyer, the grader must identify himself.

Conductivity Test

From 1940 to 1947, the enforcement of the laws dealing with maple products in Canada was a mere task. We were then helped by the Wartime Prices and Trade Board Controls. There was no adulteration or very little to our knowledge. The suppression of war control on cane sugar brought up the problem of adulterated maple products increasing from 1948 to 1949. In 1950, that is last Spring, to comply with the claims of the buyers and the requests of the American Food and Drug Administration, every barrel shipped to the United States had to be previously tested for the conductivity. For this purpose, seven teams of three men, that is: one inspector, one grader and one conductivity tester, were placed at the shipping points. Up to last September 1, over 42,000 drums were thus tested, and any sirup showing a conductivity lower than 110 and higher than 230 was seized and confiscated by the Government agents.

We believe that such a step on the part of our Department of Agriculture has been protecting the American buyers, and it is our intention to continue this inspection next year and to use also, at shipping points, the silver nitrate method for detection of chloride.

Of course, I have drawn for you only a sketch of our laws on maple products and their application. With more time at my disposal, I could have given more details. Should there be any questions on some definite topics, I will try and answer them to your satisfaction at the end of this paper.

If I were a legal adviser, I would probably stop my communication right here, but as a chemist I must carry on a little further and bring to your attention a few suggestions important to the analyst, as well as to the maple industry laws and regulations of our two countries. Of course, these problems cannot be solved this very morning, but they could be heard and discussed by the members of a committee specially appointed towards this aim by our Chairman. I mean:

(1) A study of a possible uniformness of analytical standards between Washington, Ottawa and Quebec;

(2) A tentative project of regulations prescribing chemical properties and requirements of maple products;

(3) A revision of the present A.O.A.C. methods of analysis;

(4) A revision and discussion of the present range of ash variations;

(5) A tentative program for the discovery of new methods of analysis through research;

(6) A collaborative study of the possible relation existing between the grade and conductivity number of a maple product;

(7) The adoption of the Snell silver nitrate method, in conjunction with the conductivity test, to reveal the presence of added chloride in maple products into the U.S.A.

(8) The adoption of a minimum conductivity number for all imported maple products into the U.S.A.

Such a program cannot be fulfilled by a single organization, would it be private or governmental; its achievement could be assured however by the collaboration of many. I have a firm belief that something along this line will be started at this Conference.

Discussion

Q. Were the products falling outside the 110-230 range of conductivity summarily confiscated?

A. Yes, and sent to charitable organizations.

Q. Was the conductivity measured at 25°?

A. Work was done as near as possible to room tenperature (20° C. or 68° F.)

Q. The chloride test is for testing for addition of salts. Is that correct?

A. Yes.

Q. Do you use four color standards for measuring the five grades?

A. Yes, Fancy (AA), Light (A), Medium (B), Amber (C), Dark (D).

Q. Is color the principle factor in determining grade?

A. Yes.

Q. Is all conductivity testing done by the Government and is the apparatus too expensive for individual packers?

A. Some packers are buying the equipment but the equipment is quite expensive.

THE HISTORY OF THE CANADIAN COOPERATIVE

by
R. Prefontaine, Les Producteurs de Sucre d'Erable de Quebec Levis,
Province of Quebec

Around 1920, maple products were sold in the form of sugar and sirup only and quality was not always the objective. Unscrupulous farmers and traders seriously threatened the entire industry. This could not last, for the concerns interested would not buy our products.

Mr. Vaillancourt, a young agronomist from the Department of Agriculture of the Province of Quebec, conceived the idea of reform through cooperative action. Together with Mr. Edgar Samson, he organized at Levis, in 1924, a group of seventeen farmers known as "The Association of Pure Maple Sirups and Maple Sugar Producers of the Province of Quebec." Each member purchased a ten dollar share payable one dollar a year. Provincial technicians taught the farmers correct methods of maple sirup production, and twice a week each producer sent the sirup produced to Mr. Vaillancourt and he disposed of the sirup among his friends, about 3,000 pounds the first year.

Year by year the association grew and in 1927-28 a plant and warehouse was built at Plessisville. By 1930 membership had reached 1,912, each member having contracted to send practically all of his production to the association. Each year meetings are held to promote quality and to fight adulteration.

Today there are more than 4500 producer-members in the organization with assets worth one-half million dollars and there are thousands of drums at the disposal of the members. When the season is over, the crop is transferred to the depot and thereafter it is forwarded to the plant either by truck or rail. At the plant each drum is weighed, classified and analyzed by government inspectors. A record is sent to the producers with their checks. The members receive a first installment in spring and at the end of the year after deduction of reserve for operating expense. The surplus is returned to the members according to the quality of the sirup supplied by each of them.

The daily capacity of production (10 hours) is 100,000 pounds of sugar, and one of the warehouses has a storing capacity of 20,000 drums and the other a capacity of 6 million pounds of sugar.

For administration, the Province is divided into six sections, in each of which five directors are elected at the annual meeting. These directors are delegated to the general meeting held at the beginning of each year. At the annual general meeting, a central executive committee of five directors is chosen, and none of these directors receive any compensation except traveling expenses.

The "Quebec Maple Sugar Producers" has accomplished the following:

(1) Improvement in quality and processing.

(2) Producers can dispose of their crop more easily.

(3) There is more profit for the producer.

Discussion

Q. What percent of Quebec's production is represented by the cooperative?

A. Twenty-eight percent.

Q. Has the cooperative been successful in improving the quality of the sirup produced?

A. Yes. The farmer has been taught how to make fancy sirup and he is protected by law.

Q. What is the retail price of AA sirup? What does the cooperative member receive for a gallon?

A. Five dollars for the light grade. The member received 24 cents per pound -- (about $3.15 per gallon).

Q. Then each member receives a proportionate share at the end of the year and about how much was it?

A. Each member receives a proportionate share at the end of the year and last year this amounted to 4 cents per pound.

THE NEW HAMPSHIRE MAPLE PRODUCERS ASSOCIATION

by

C. A. Lyon, State Department of Agriculture, Concord, N. H.

The New Hampshire Maple Producers Association was organized in 1943 with the following objectives in mind:

To coordinate and correlate the advertising and publicity of all the maple producers in New Hampshire; to perfect an organization which can effectively represent New Hampshire producers, to encourage grading and standardization of maple products; promote increased development of the maple industry, to establish a registered label; to encourage greater use of pure maple products and promote protective legislation; to cooperate with state agencies in developing a program for the maple industry of the state and to work for the enactment of legislation which will protect and enhance the safety of the maple industry in New Hampshire.

The maple producers have attempted to accomplish their objectives by advertising, organized leadership, national and regional cooperation, sponsoring methods for grade improvement, development of the maple industry, and design of an association label. A printed folder is prepared each year listing the name and address of the members. Maple product displays are encouraged at State fairs. Negotiations were carried on with the O. P. A. regarding price ceilings. The association lends support to such activities as special weather reports and the work of State experiment stations on maple. For improvement in grading, color sets and hydrometers have been made available on a cost basis. A yearly competition in the production of maple sirup is held at the annual meeting.

To encourage the youth, a state-wide contest is sponsored for 4-H and Future Farm boys and girls.

Interest is encouraged by maple meetings and maple exhibits. An attractive and distinctive label has been designed for the use of members.

The value of the Association has been of such importance as to merit the formation of a like association in every state where maple products are produced and perhaps on a national level as well.

Discussion

Q. Are the outfield meetings held on a state or county basis?

A. State basis.

Q. Are the meetings held in conjunction with the education department of the Extension Service?

A. The meetings are sponsored by the Association but in cooperation with the Extension Services.

THE FUNCTIONS AND AIMS OF A MAPLE PRODUCERS' ASSOCIATION

by
Clyde N. Smith, Vermont Maple Sugar Makers' Association, Burlington, Vermont

The Vermont Maple Sugar Makers' Association was organized in 1893. The object of the Association was "to improve the quality", and "protect the manufacturers and consumers from the many fraudulent preparations placed on the market as pure maple products."

In 1908 the Vermont legislature appropriated $500.00 to the Association and required it to hold a meeting of at least three sessions annually, hold a maple exhibit each year providing prizes for the best quality product, and distribute an annual report to the sugar makers. Even though this financial aid has been withdrawn, these functions have continued.

After incorporation in 1934, and especially after re-incorporation in 1946, there was a renewed activity in the Association. The Association sought and secured increased cooperation from various State and Federal agencies as well as producers in developing sound principles of organization, improved operation and marketing principles, and increased publicity.

The Association studied the status of the maple orchard operations and found that the number of trees tapped declined from approximately 10 million in 1890 to less than 4 million in 1947.

The Association established and maintains a card index which lists the names of producers, their addresses, location of the orhcard and the number of buckets hung. This index has proven extremely useful in preparing separate mailing lists and provides necessary information most helpful in making arrangements for local and county meetings.

Another activity of the Association is the Price and Crop Reporting Committee. This committee collects and analyzes data on production and price trends during the sugaring season. Data so collected and analyzed are released weekly to the press and radio and are followed by a summarized report to members. Preceding each production year this committee establishes the carry-over supply of sirup in the hands of the processors and producers. It also estimates, from 1000 producer-reporters assembled at 13 county meetings, what a fair price should be, assuming normal production. The Publicity and Executive Committees have been instrumental in controlling the quality of the product offered at the Eastern States Exposition and other fairs and conventions. They accepted complete responsibility for the Maple Booth in the Vermont Building at ESE since 1949.

Legislation has been one of the important functions undertaken by the Association. That we now have a grading law is largely due to the efforts of the Association. The Association now shares in the responsibility of the State Department of Agriculture's enforcement program.

The Association, viewing the disappearing maple stands with alarm, has taken definite steps to encourage individual maple producers to maintain and develop, through approved forestry practices, their own maple orchards. The E. H. Jones Maple Industry Improvement Project, sponsored by the Association, selects a model orchard each year. The winning producer gets press and award recognition and as a result, good practices are brought to the attention of the other producers. Out of this project has come technical and practical observations leading to improved orchards. The Association sponsors youth programs designed to interest the youth in maple farming.

Summarizing, the Association actively encourages honest grading and labeling of maple products; investigations designed to improve quality and marketing techniques; wise orchard management; timely crop and price reporting; and national publicity through expanding public relations programs.

Discussion

Q. Has this price prediction met with objections from the anti-trust people?

A. No. The Association does not attempt to set the price, it only conducts a fact-finding survey and reports its findings.

Q. Has this price suggestion held through the season?

A. Reasonably so, depending on whether the supply was normal or not.

THE MAPLE INDUSTRY IN MINNESOTA AND WISCONSIN

by

S. A. Holbert, Holbert Brothers, Onamia, Minnesota

In 1946 there were only six semi-modern maple processing plants in Wisconsin and Minnesota. In an effort to stimulate an equipment distributing business, Holbert Brothers set up and operated a maple processing plant, tapping some twenty-eight thousand trees. As a result of demonstrating that such an operation was profitable, fifty new plants were sold and put into operation that year. During the past four years the number of modern maple processing plants has grown from six to one hundred and fifty.

In the Minnesota-Wisconsin area there are vast untapped maple forests. It is conservatively estimated that there are five million untapped trees in this area, the larger portion in Minnesota. It is probable that the undeveloped areas will come into production earlier in Wisconsin that in the less accessible Minnesota area. In Minnesota maple sirup production was primarily a hobby. With increased availability of equipment and know-how, coupled with the development of new roads, it is expected that there will be a great increase in the number of tappings in the near future. This possibility is foreshadowed in the development during the past few years. In Minnesota there has been an increase of two hundred and eight thousand in the number of trees tapped for a total of three hundred thousand. In the earlier developed Wisconsin area, there has been an increase of two hundred thousand, bringing the total in that area to approximately a half million. These increases bring the total number of trees tapped in the two areas to roughly eight hundred thousand.

A Producers' Association has been established in the area to disseminate technical information and marketing experience.

Since the industry is very young in this area, it seems to me that we are not bound by traditions and we are open to modern improvements. I like the new grading system proposed by Mr. Bostwick this morning. (See paper in this report by E. P. Bostwick, "U. S. Standards for Maple Sirup".) We find that the Western retail buyers prefer a darker colored and more pronounced maple flavored sirup than that generally accepted in the East.

Discussion

Q. What types of maple products do you produce?

A. Maple sirup, maple cream, maple confectionaries and highly flavored maple sirup for the blending and flavoring industries.

Q. How does your season compare with that of Vermont?

A. Since the area extends farther north than Maine and as far south as West Virginia, our season is longer. The opening date varies from February 15 to April 15.

Q. How far do you transport sap?

A. A maximum of 40 miles by truck.

Q. Is it correct to assume that you have no grading system at all?

A. It would be incorrect. While Minnesota has no State grading code, we, as a merchandizing company, have set our own grading standards in an effort to assure the consumer a uniform product. Wisconsin does have an optional State grading code.

Q. What are your yields in pounds per bucket?

A. In our best year we got one gallon of sirup from four buckets of sap. We average approximately one for every seven-and-a-half buckets of sap.

Q. How are your trees situated?

A. In Wisconsin, where there are more old sugar bushes, they are more open and have wider crowns. In Minnesota, they are mainly forest stands with small crowns.

Q. You mentioned a vacuum pan evaporator, what effect does this equipment have on flavor?

A. The experience of the Antigo Wisconsin Cooperative with evaporation of sap in a vacuum milk evaporator has been that it produces a very light colored sirup with a delicate flavor.

MICHIGAN'S MAPLE SIRUP INDUSTRY

by
P. W. Robbins, Michigan State College

Michigan from early history has held an important place in the production of maple sirup and sugar. Since 1850 it has never ranked below sixth place in the annual production for the United States. The development of Michigan into a great manufacturing center in the late Nineteenth and Twentieth centuries, especially becoming the hardwood furniture capital of the world, speeded the depletion of the sugar maple forests. This, together with cane sugar beginning to undersell maple sugar about 1875, prevented Michigan ranking in production with Vermont and New York in the production of sirup and sugar.

Michigan witnessed the depletion of its virgin stands of sugar maple forests but the second growth stands are rapidly restocking the forest lands.

The picture is not dark, for maple sirup and sugar production in Michigan is growing. It has climbed from fifth place in the United States to fourth place in 1943 and has held this rank since. The 1944 production was 53 percent greater than the ten year average 1933-1942.

Since the war more new sugar bush equipment has been sold in Michigan than in former years. One of the Vermont maple sirup equipment manufacturers told me a few years ago that his firm had sold more evaporators to new producers in Michigan than they had sold in Vermont state.

It is my firm belief that our production is higher than we can determine from our crop reports.

WHY THE FUTURE FOR MAPLE SIRUP PRODUCTION IS BRIGHT IN MIGHIGAN

First. The virgin stands of sugar maple forests logged for their lumber have been broken up into our most productive farm lands.

Second. The clearing operations on these farms did not remove all the second growth sugar maple.

Third. Sufficient time has elapsed since the logging days to allow many of the second growth sugar maple trees in the woodlots to reach suitable size for maple sap production.

Fourth. Michigan is one of the leading tourist and resort states of the Nation, and the small communities and rural residents realize their potential tourist market for all agricultural crops - including maple sirup.

Fifth. Michigan's maple sirup production areas are not far removed from large and small cities. This fact has enabled the producer to market his product direct to the consumer.

Sixth. During the past four years there has been an ever increasing interest shown by our farmers in the development of their maple woodlots for maple sirup production.

What has Michigan done to aid the producer and the prospective producer of maple sirup and sugar?

First, may I mention the part industry has played? A sugar bush equipment and supply company has developed from one man's hobby to an important place in the sirup industry of our state. You are all aware how easy it is for farmers and all of us to put off decisions to order equipment from some far off company. Now that all equipment from evaporators to labels can be inspected by short drives to the center of our state, producers and prospective producers not only look, but they buy.

One company has pioneered maple sirup labels equal in quality and sales appeal to the best labels found on standard can goods in our retail stores.

I now know of four maple sirup equipment dealers in our state where there were none back in 1930. These dealers handle only the best in equipment and they have by competition forced the corner hardware store to handle better buckets, spiles and tin containers.

The Michigan Farmer, our state's bi-monthly farm magazine has consistently aided the extension of our maple sirup industry by printing timely articles and by full cover pictures. (May I call your attention to the March 1946 and February 1950 covers?)

NOW WHAT HAS MICHIGAN STATE COLLEGE DONE TO AID THE PRODUCER AND THE PROSPECTIVE PRODUCER OF MAPLE SIRUP AND SUGAR PRODUCTION IN OUR STATE?

1. Our extension foresters bring new ideas to the old producers and aid the prospective producer in management of their maple woodlots to improve the production of lumber and sirup. They accomplish this by county agent-sponsored meetings and demonstrations in farm woodlots.

2. Our extension foresters sponsor county-wide and sectional meetings where they demonstrate sugar bush equipment and management in actual sugar bush operations.

May I describe one such meeting held near Kingsley, Michigan, April 19, 1950?

This meeting took the form of a Conservation Field Day for Leelanau, Benzie, Grand Traverse, Manistee, Kalkaska, Antrim, Wexford and Missaukee counties. These eight counties all had wonderful stands of hardwood timber on their rolling ridges and pines on their sandy flat lands in the early days. Today, hardwoods, predominately sugar maple, have restocked the cutover rolling lands that were not cleared for agriculture. This Conservation Field Day covered subjects as follows:

1. Northern Game and Song Birds.
2. Forest Fire Prevention and Suppression Equipment.
3. Fire Line Road Construction.
4. Forest Tree Planting.
5. Growing Trees From Seed on the Farm.
6. Machine Tree Planting.
7. Managing the Farm Woodlot to Increase Growth and Quality.
8. Estimating Standing Timber.
9. Saw Filing.
10. Demonstration of Modern Sugar Bush Equipment and Concentrating Sap to Sirup in an Actual Sugar Bush Operation.
11. Chemical Sprays to Control Woody Plants and Poison Ivy.
12. Control of Forest Insects on Pine Plantations.
13. Pruning Pines for Christmas Tree Production.

I have listed all the demonstrations for I wished to picture this community's cross section of activities. It is not the best general purpose farm land - though it contains some of the most valuable cherry orchards in our state. The soils and topography require many types of activity to get the most out of the land.

The farm implement dealers furnished tractors and wagons to transport the visitors who wished to ride to the various exhibits. There were specialists at all the demonstrations, which stopped and started every half hour. Those in charge stated that over 4,000 people were present.

3. The College has since 1913 operated a sugar bush on the campus at East Lansing, and a second one at our Agricultural Experiment Station at Chatham in the Upper Peninsula. These sugar camps are open for inspection by producers and prospective producers during any period of the year.

4. The Forestry Department has prepared and distributed bulletins on maple sirup production.

5. Research work in maple sirup production has been conducted for many years.

May I tell you about this as it affects sirup production in our state?

Michigan State College's Radio Station broadcasts weather reports direct from the Weather Bureau Office every day from Monday to Saturday inclusive. These broadcasts include (1) local forecasts, (2) summary of Michigan weather, (3) description of weather over the United States, and (4) the one we are concerned with, special forecasts and advice for agricultural activities adjusted to the needs of seasonal operations.

Ten years ago the Forestry Department thought it would be very valuable to our maple sirup producers if they knew when sap weather would arrive. Therefore, in cooperation with Mr. H. M. Wills of the Michigan Section of the U. S. Weather Bureau, we endeavored to forecast sap weather and catch the first sap runs. After two years of trial and error we concluded that when the spring weather forecast freezing nights, but day temperatures of 43 degrees, or better, with some sunshine and with no cold wind, we could assure a sap flow.

In 1942 we started our forecasts over WKAR notifying the farmers 24 hours in advance of the approach of sap weather. In 1943 and 1944 we accurately forecast the arrival of several days of suitable sap weather in succession. As a result the production in Michigan was up 25,000 gallons in 1943, while at the same time the production of the remainder of the country was down. (See U.S.D.A. Maple Products 1916-1946.)

In 1944 the United States production was slightly above the 10 year average, but Michigan made a gain of 58,000 gallons, or nearly six times the average United States gain. Michigan was the only state that made consecutive gains through 1943 and 1944.

The weather forecasts in the years since 1943 and 1944 have found the farmers more and more favorable toward and confident in our early sap weather information.

About this time Joshua Cope in New York had proved that hanging out the buckets before there was any indication of sap weather did not appreciably reduce the sap flow. Thus, it was not so essential that sap weather forecasts be followed. However, we have found in Michigan that the producers are reluctant to hang out their buckets about Washington's Birthday (which is around our usual first sap week at East Lansing) unless they have some assurance of good weather. Therefore, we have continued to forecast sap weather throughout the entire sap season 24 hours in advance. Forecasts of a cold snap following a good run have enabled farmers to gather their accumulated sap and avoid having it freeze in the buckets.

I do not wish to imply that the weather forecasts are entirely responsible for our increase in sirup production, but it has been a contributing factor.

MAPLE SAP FLOW EXPERIMENTAL WORK

In 1933 we started a series of sap flow recordings at East Lansing and Sault Ste. Marie, Michigan, in which we recorded the flow of maple sap from 215 trees and from over 400 tap holes each year for four years. These experiments endeavored to show the relation of maple sap flow to the compass position at which a tree is tapped, and to make recommendations to producers as to the best tapping positions. The results prove the following:

1. The positions customarily tapped by sugar bush operators (south and west) are not the only high production areas.

2. The variations of the average daily sap flow between the south, west and east are not great enough to warrant concentrating tap holes on any one of these three positions.

3. The east side is as large a producer as the south. The east side produced an average daily flow for all four years of 8.5 pounds and the south 8.3 pounds of sap.

4. The flow of sap from the north side of a maple tree is sufficient, in comparison to the production from the other compass directions, to warrant recommending tapping the north side of maple trees in the sugar bush.

5. The four year daily averages were: East, 8.5 pounds; West, 8.1 pounds; South, 8.3 pounds; and the North, 6.6 pounds.

Therefore, we have proved to our Michigan operators that it pays to tap on the east and west as well as the south side, and on the north side provided sufficient buckets are hung on the north position to make it practical to gather late in the season when the north positions will still be producing after the south, west and east sections have stopped flowing sap.

This factual information has convinced our farmers that tapping the entire circumference of the maple trees in their bushes will lengthen the productive life of their trees and at the same time maintain production at a high level.

In 1929 I built our first steam evaporator which we used until 1941. This evaporator concentrated sap to sirup so rapidly that a very mild flavored light colored sirup could be produced. However, we soon learned the Michigan public did not relish the mild maple flavor, but preferred the darker colored stronger maple flavored sirup. The need for skilled operators to handle 100 to 125 pounds pressure boilers soon convinced us that steam evaporation could not be recommended for the average farm. The cost of an adequate and safe steam boiler required a greater capital investment with a higher depreciation and maintenance cost than a fire arch flue pan evaporator. Therefore, steam was discontinued in favor of the conventional evaporator in 1940.

Michigan produces a large amount of mint on our muck lands and we still recommend steam evaporation of maple sap to mint farmers who also have a sugar bush, because these farmers own or own in cooperation, adequate high pressure steam boilers for their mint stills.

Steam affords positive control of maple sap to the proper density sirup. It provides the best means of sterilizing buckets, covers, containers and other equipment.

It is my firm belief that a large operation would be most efficient if maple sap were concentrated to 215 to 216 degrees F. on a fire arch evaporator and finished in a small steam evaporator.

We proved to our farmers that the small steam finishing-off pan permits:

1. Finishing an entire batch of sirup at a uniform density.

2. That the sugar sand will settle to the bottom of a steam finishing pan if the maple sirup is just simmering at 7 degrees above boiling water.

3. It produces clear sirup and requires the use of fewer filters.

4. That the sugar sand may be blown out of the finishing-off pan with live steam after every batch of sirup has been drained off.

Michigan has proved that its maple sirup is as high quality as any sirup produced. In 1944 a gallon selected at random from a Michigan sugar bush won first place at the Plymouth Fair in New Hampshire where maple sirup from all the producing states was exhibited.

Michigan has no state wide Maple Producers' Association. There are five or six local associations which endeavor to fill the need, but we do need a state wide organization.

Two years ago two of the local associations endeavored to arouse interest for a state wide association by appointing a temporary committee which is keeping the issue alive.

However, as long as the producer can sell practically all of his product direct to old established and to new customers, it may be difficult to sell him on the need of an association or a standard grading law.

Michigan has no state grading law for maple sirup. Our Eaton County Producers' Association endeavored to secure a grading law a few years back but was unsuccessful.

Michigan State College has endeavored to keep interest alive for a grading law and an association.

The Forestry Department has collected weather data and made sap flow measurements which we have endeavored to correlate and come up with a good sap flow prediction formula, but to date, we have nothing to release. However, we think we are on the right track and hope in the near future to have something worthwhile to offer on sap flow prediction.

Michigan farmers, through our forestry extension and our farm forestry activities, are more aware today than ever before of the value of their farm woods, and the part it can play in producing an annual cash income in the form of maple sirup and periodic timber harvests.

May I cite an example? Last spring, at our Conservation Field Day, one farmer doubted the ability of the sugar bush making any profit with all the investment required and the hard work connected with it. I spotted a producer on the fringe of the audience who had left his son in charge of his evaporator and came over to our meeting. So I asked him to tell the "doubter" how much sirup he made last year and his average sale price. He had made 1100 gallons and averaged $4.75 per gallon. The audience went away with the conviction that any farm activity which could produce a gross of $5,225.00 in eight weeks representing mostly labor would be time well invested on the farm.

Our predictions are that a continued expansion of maple sirup production will take place in Michigan.

Discussion

Q. How accurate are your weather forecasts?

A. They are usually very close, especially for the first run which is the most important.

Q. Does your statistician agree that you have correlation between the kinds of weather conditions and good sap flow?

A. We cannot be positive as yet but it appears so. We are developing a formula which will take into account all factors involved.

Q. Have you made any tests on tree diameter versus sap flow?

A. Yes, diameter, crown length and spread, etc., have been studied. We have not yet put the results together to come to a definite conclusion.

Q. Work on the north tap hole by Tressler and Zimmerman was not extensive. They did not particularly recommend tapping on the north side. Taylor has made more extensive measurements along these lines.

A. The Forestry Department is mainly interested in prolonging the life of the tree and therefore recommends tapping around the tree.

Q. How high are the trees usually tapped?

A. Three to three and one-half feet. Too high tapping may kill the tree.

Q. When we here at Eastern Regional Research Laboratory had to predict weather conditions in northern Pennsylvania from Philadelphia forecasts, we found it was largely a matter of guesswork.

A. We can forecast pretty well for the area around East Lansing, but it is more difficult for northern Michigan.

Q. The New York rural radio network broadcasts the Albany weather forecast. However, accuracy is not too good for points some distance away, such as Buffalo.

A. We have prepared a ten-page bibliography on maple sirup production. If anyone is interested, we can have it mimeographed and send copies.

WHAT IS NEW IN MAPLE SIRUP EQUIPMENT

by

R. C. Soule, George H. Soule Company, St. Albans, Vermont

Important improvements in maple sirup equipment were made shortly before 1900, but only a few since. A survey made recently in New York State showed an average total labor cost of 96 man-minutes to produce a gallon of sirup, of which 28 were used in preparation and cleanup, and 36 in gathering sap.

The portable power tapping machine, recently introduced, is carried on an army pack-board. It weighs only 35 pounds and includes an aluminum, 1 HP gasoline engine, weighing 17 pounds. The shaft runs at 3300 RPM, and a gear shift to reduce it to 750 RPM when desired, e.g., for a bucket brush. Holes are drilled 3 or 4 times as fast as by a bit-stock or a breast-drill, and deeper. A deep hole lengthens the sap season, as the interior of the tree thaws more slowly than the outer part and veins in the sap wood are cut which otherwise would not be in a shallower hole. The Soule Company has sold 1400 of these machines, and there are perhaps 1400 home-made ones in use also.

A revolution in sap gathering is the vinylite sap bag to replace the conventional bucket. Empty, it flattens to about 12 inches by 20 inches, and weighs only 4 ounces, thus practically eliminating the bucket storage problem. It is plasticized to withstand temperatures of 30° below zero Fahrenheit, and is not attacked by mice or rats. Full, it holds 13 to 15 quarts. A conventional malleable iron hookless spile is used, which acts as a pivot for tipping the bag to empty it into the gathering bucket. The bag has a heavy removable disc acting as a bearing for rotating the bag on the spile, and the spile has ribs to prevent it from rotating in the tree. Any ice from freezing of the sap can be left in the bag to keep the next sap cold and prevent fermentation and darkening; finally discarded, it reduces by that much the evaporation to be done in the sirup pan. The top opening and the spile are covered by a flap, to keep out dirt and snow. The bacterial count of the sap averages much lower than with sap-buckets. The only disadvantage is that holes cannot be tapped very high up on the tree, as it is difficult to reach overhead to tip the bag for emptying. To wash the bags, they are turned inside out and put in an ordinary domestic washing machine, either hand or automatic, about 28 bags to a load. Hot water does not affect them; even boiling water only causes temporary softening. The material, vinylite, is very strong and tough, not injured by rubbing against the tree. Though first offered for sale by the Soule Company only a month ago, the material has in tests given six years' service without wearing out. Accidental holes can be repaired by using a solvent for adhesive and pressing on a patch of the same material. The bags are sold to producers at 69 cents each. The hookless spout sells for 7-1/2 cents each. The Soule Company has applied for patents on the bags.

Another propcsed improvement is the use of plastic pipe, instead of metal, to convey sap from the field tanks to the sugar house. Its smooth surface is easier to keep clean and sanitary than rough and possibly rusty metal pipe, hence fermentation in the sap is lessened.

TRENDS IN EVAPORATOR DESIGN

by

R. H. Maroney, Vermont Evaporator Company, Ogdensburg, New York

The earliest maple sirup evaporators were built in New England; they had flat-bottomed pans, as shallow depth was considered essential to the production of light-colored sirup. Next came the "Champion" evaporator, having corrugated-bottom pans connected by siphons. Then as the cost of labor increased, deep flues were added to the sap heating and evaporating pan to increase economy of wood fuel. The last pan, in which the sirup is finished off, remained flat for easy cleaning. This principle is now practically universal, though various arrangements to facilitate reversing the sirup flow are used. The Vermont Evaporator Company prefers to use three pans, though some other manufacturers prefer two.

The maple industry will continue to diminish in importance unless we give more thought to the future. We must not lose the results of 40 years of effort by the various research agencies. Moreover, the public must be brought to realize that sirup should be of the finest quality possible, and that scientific progress can assist in this.

Discussion

Q. What is the arrangement of your three pans?

A. The first, or heating pan, is next to the chimney, the sirup pan in the middle, and the evaporating pan over the fire. The sirup pan is subdivided so that the flow of sirup can be reversed from time to time, to remove deposits of sugar-sand.

Q. Do you make small evaporators?

A. At first we aimed to sell principally to large producers; then we designed a very small evaporator, 2 feet by 4 feet of English tin-plate for a bush of 50-60 trees. It worked well, and we sell it for $140.00.

Q. Do you prefer the finishing-off pan to be separate?

A. Not necessarily.

Q. Are there any operators who can draw off sirup continuously, not batch-wise?

A. In New York State there is a 20,000-bucket bush in which the drawoff is almost continuous; the sirup runs out steadily 2 to 3 hours at a time.

A. (Dr. Robbins, from the audience) We feed a 3/4 inch pipe stream of sap, and tried to drawoff sirup continuously, though the stream was only the size of a match, but with a wood fire the variation in heat made it impossible. Perhaps with an oil or gas fire it could be done.

A. (From audience) It is also essential to supply sap of constant sugar content.

A. (Mr. Holbert, from the audience) In our large evaporating plants we have girl operators to control the sirup; we find them careful and conscientious. For sirup control we use two thermometers, one in the boiling sap to compensate for variation in barometric pressure, the other in the sirup; a constant difference between these signifies a constant sirup density.

A. (Mr. Hubbel, from audience) In our bush of 3000-3500 trees, we use oil fuel, but cannot draw sirup continuously because the flow is too small. We like oil because the constancy of the heat enables us to predict accurately how much sap we can handle in a day.

Q. Steam-heated evaporators have the advantage that the heat can be turned off instantly when drawing off sirup. Does your company make them?

A. No; they are too expensive to install.

Q. In a location where wood is scarce, and coal as cheap as $3.00 a ton, would you consider a steam-heated evaporator desirable?

A. Probably.

A. One serious difficulty with a steam plant is deterioration of the boiler when not in use. If not well cared for it rusts badly in the idle season. In freezing weather it must be kept hot or else drained, otherwise it will burst by freezing.

A. (Dr. Robbins, from the audience) In Michigan we have a number of steam-distilling plants for the production of oil of mint, so in those locations steam is available.

Considerable flavor is lost to the air during processing of block sugar. Work should be done to correct such loss.

The producer must receive as high a price as possible for his sirup to keep him producing and to keep the bushes from the saw mill, but we must not price ourselves out of the market. Greater efficiency in buying and manufacturing can help accomplish both objectives.

The nation-wide advertising carried on by the blenders promotes the sale of pure maple sirup also by keeping the word "maple" before the public. Sales of blended sirup do not compete with pure maple sirup since they sell in a different price range to persons who cannot afford pure maple. Since the use of maple in tobacco has declined in recent years, the blenders are the best customers for the darker maple sirup.

The problems confronting the maple processor and producer are many and complex and all segments of the industry must cooperate closely together with the assistance of the State and Federal Agencies doing research work.

Discussion

Q. Would recovery of maple flavor lost during processing be practical?

A. It may be but several people have stated it is very difficult.

A. One group condensed the total vapor, absorbed the organics on carbon and extracted with an organic solvent but obtained very little flavor and that obtained was of a non-maple character. Recovery did not appear warranted.

A. Loss may be mostly mechanical entrainment of sirup, or caramel flavor rather than true maple.

Statement

Wood is a better fuel than gas, oil, or coal for producing sirup since you get a hotter fire. Proportionately more fancy sirup is produced over wood fires.

A. Wood fires are not inherently hotter than fires from other fuels, and other fuels should work equally well on evaporators designed for their use.

Q. Is flavor independent of color?

A. Concensus of several comments they are not entirely independent.

Q. Is there unlimited sale for fancy sirup?

A. Sometimes processors heat fancy sirups to increase color and flavor.

THE BLENDED MAPLE SIRUP INDUSTRY

by
Hovey Burgess, General Foods Corporation, Hoboken, New Jersey

The retail sales for maple table sirups through the usual grocery outlets amount to about 8,325,000 gallons exclusive of direct sales from producers through roadside stands or mail orders. About 3 percent of this is pure maple sirup.

PROBLEMS OF THE MAPLE SIRUP PROCESSOR

by
Frank Rees, United Maple Products, Inc., Burlington, Vermont

The maple sirup processor furnishes facilities beyond those which would be practical for the individual producer to manufacture candy, grocery items such as cream, soft sugar, sugar cakes, industrial flavoring sugar, pure maple sirup in glass and small tin containers and sirup made by blending with cane sirup. Through these products the processors have increased the value of maple sirup to about 4 times that of cane

Processors handle 50 percent of the sirup from Vermont and New York. It is a comfor to a producer to know before he taps that he has an assured cash market for all of his sirup, light and dark.

The processors' functions consist of buying sirup, manufacturing maple products, and selling these products.

The following estimates given for the number of trees tapped in various years show that the maple industry in the United States is declining rapidly and faces extinction.

1935	12,341,000
1940	9,957,000
1944	8,681,000
1945	7,330,000

From 1935 to 1940 the loss was about 40 percent in Vermont, 20 percent in New York, and 50 percent in Pennsylvania. These large decreases are most alarming since it requires 40 years to regrow the trees and relatively few trees have been set out in the past 15 years. Maple worms and a hurricane have destroyed some orchards but cutting for lumber has destroyed the most trees. The combination of high lumber value and high labor costs for producing sirup has tended to increase cutting.

In Canada there are a great number of untapped trees, and lumber demand is less. Maple is more often the chief cash crop and "family" labor is more abundant. Hence reduced production will not be expected for some years.

Professor Cope demonstrated that by judicious cutting some cutting can be carried on without decreasing the amount of sirup produced. It is hoped the work of Dr. Marvin, Dr. Taylor and others will also help.

Formerly the producer delivered filled drums to a central loading point for grading and weighing. Now the processor distributes drums in advance of the season and often must grade and weigh filled drums on the farm, a much less economical procedure. Since buyers pay the same price for unfiltered as for filtered sirup, less filtered sirup is placed in drums.

Recently the adulteration of Canadian maple sirup with cane sugar has become a problem. Conductivity tests are now made on all importations, but a more conclusive test is greatly needed, since the values on known pure sirups vary widely.

In maple products the item being sold is flavor, thus any treatment altering or reducing flavor is wrong. It is possible to go too far in reducing sirup boiling time so that optimum flavor is not developed. A processor cannot pack strictly fancy sirup since the necessary packing at 180° F. causes a 1/2 grade darkening.

Assuming the remainder contains about 15 percent maple, the blended maple sirup industry consumes the equivalent of about 1,211,000 gallons of pure maple sirup out of about 1,600,000 produced in the United States and 2,500,000 produced in Canada. Additional maple sirup goes to industrial users for flavoring candy, ice cream and tobacco.

Producing blended maple sirup consists basically in mixing fine maple sirup or redissolved maple sugar with the desired proportion of cane sirup, adjusting to the proper percent sugar, bottling at about 190° F. and labeling. The maple sirup is deleaded if necessary by adding a quantity of sodium diacid phosphate and filtering. Lead comes largely from terne plate buckets or soldered seams. This problem is less critical now since more aluminum buckets are being used.

Maple sugar and sirup lots are carefully examined and blended to give as nearly uniform flavor and color as possible to the product. Excessive invert content causes darkening of the final product. Insoluble material requires more frequent cleaning of the filter presses. Detection of adulteration by conductivity, malic acid and other tests is best accomplished at the producer level. If sugars on hand are lighter than desired they are darkened by extra boiling. A small panel of experts tastes all incoming lots and determines the proportions for their use. This industry is handicapped by the custom of grading by color because there is a wide variation of flavor within color grades.

The cane sugar sirup used should be low in ash and invert sugar content since invert results in ultimate darkening of the product during storage.

As distributed the sirup is sterile, but during use mold growth sometimes occurs. This is usually associated with surface dilution of the sirup sufficient to allow growth. Although there are a number of suitable preservatives, I know of none now being used. If the sirup has too high a solids content, sugar may crystallize out and be mistaken for glass. This occurs particularly during the winter or on storage in a refrigerator and after partial evaporation during use.

The industry has used a blend containing 15 percent maple sirup for years, but there has been no control over flavor intensity since the pure maple sirup flavor is so variable within a grade.

The flavor intensification work at the Eastern Regional Research Laboratory may be a step in the right direction but so far it has not been evaluated on a large scale. This process gives high temperature treatment by boiling off some of the water.

George S. Whitby holds U. S. Patent 2,054,873 for heating normal sirup to elevated temperatures in a closed system under pressure to increase flavor.

There is considerable aroma lost during evaporation and it may be that some aroma collection method can be devised. A great deal more could be done with intensification and recovery of maple flavor if we know its composition and chemistry.

Discussion

Dr. Wells - We are working on the chemistry of maple flavor and hope to learn more about its composition in the future.

Statement

Apparently we have developed a preference for dark blended sirup. We may be able to sell lighter sirups by education.

Q. Does General Foods prepare different blends for different sections of the country?

A. No.

Q. How was 15 percent maple arrived at?

A. Probably economic considerations. Fifteen percent is probably the lower limit at which maple can be tasted suitably.

Q. How is flavor controlled?

A. The taste panel attempts to blend consistent lots to a uniform blend.

Q. What are the qualifications of a taste expert?

A. Men associated with maple for some years and educated to compare with standards. They cannot tell public acceptance directly.

Q. What section of the country uses the most blended sirup per population?

A. Probably the west coast (agreement of several people).

Q. Do some sections prefer synthetic maple flavor?

A. Yes.

ROLE OF EXTENSION SERVICE IN AIDING MAPLE PRODUCERS
What It Is and How It Operates

by

C. E. Potter, Extension Service, U. S. D. A.

The educational program of the Extension Service brings to rural people the practices, methods, procedures and an understanding of problems that lead to better living. The Service was established by the Smith-Lever Act of 1914 which set up cooperative extension work with shared responsibilities between the State agricultural colleges and the United States Department of Agriculture. Quoting from the Act, its purpose is "to diffuse among the people of the United States useful and practical information on subjects relating to agriculture and home economics and to encourage the application of the same."

The real job of the Extension Service is to help people discover and to analyze their problems and to assist them in devising ways and means to solve these problems. The Service is in a sense conducting a self-help kind of educational program which includes study of the problems of production, marketing, development of better homes and better communities. It is directed toward all age groups, young and old; in other words, it is for the entire family. In the field of home economics and in certain agricultural enterprises the work of the Extension Service is adapted to urban as well as to rural areas.

The county extension program is developed cooperatively by the people of the county working with the county and State Extension agents and representatives of the Extension Service of the U. S. Department of Agriculture.

The county extension agent is the key to the program. In conducting such a program the people assume a considerable amount of leadership. They head committees, take part in panel discussions, taking over the responsibilities of many of the county's educational projects, which consequently requires that more than one million of our rural population assume leadership in some phase of extension work. This system of lay leadership is unique. Such an arrangement permits the efforts of the county extension agents to be multiplied many times.

The real object of the Extension Service is to make it possible for the farm people to understand the why as well as the what of their farm problems.

The part played by the Extension Service of the U. S. D. A. is to aid in the program planning and assist in fiscal arrangements. During the past year 54 percent of the funds were supplied from within the state and 46 percent by the Federal Government.

In each State there is a Director of Extension who is head of the work for that State. Associated with him are State supervisors of county extension agents and extension specialists who are responsible for subject matter and leadership in specific programs, and who give training to agents and assist in keeping them abreast of research developments.

The staff of the Director of Extension at the agricultural college is not fixed but is determined by the needs and finances of the State. The number of the staff and the projects handled will vary.

Extension personnel rely mainly upon research accomplishments of workers in the U. S. D. A. and the State experiment station but research by reliable private organizations is also recognized.

The county extension agent, while he must look to the college as a source of information, in turn relays to the college the problems of the farm people. One such problem might be the need of a comparative study of the relative advantages and disadvantages of the three types of fuel, wood, oil and coal as heat sources in operating an open pan maple sap evaporator.

The county extension agent is a teacher and he must have a lot of know-how for getting a job done. Thus he must keep the people in his county informed of the good practices coming out of research and help to develop leadership among them in applying it.

The county extension agent finds that he is called upon for information regarding all kinds of products and in so doing he must understand production, processing and marketing, and the State, national and international factors which have a bearing upon these processes.

The Extension Service has long since learned that one of the best ways to lick a problem is at the conference table where the solution can be worked out.

The Extension Service can help maple producers and processors:

1. By informing people of the importance of the problems and what needs to be done - carry the findings of research to the field.

2. By helping people to organize to carry out a program designed to improve the efficiency of the industry - to get people to understand and act.

3. By providing leadership in setting up conferences, meetings, tours and other educational media through which organizations and agencies, producers and processors can act to further the efforts and understanding of all interested groups.

Mr. Potter's talk brought up a number of questions. Dr. Wells expressed the hope for a close alliance between the Laboratory and the Extension Service so that the maple producer would become familiar with the results of our researches here.

Q. Are there any States doing research work on maple under the Flannagan Act?

A. No. The only research now conducted on maple products is at the E. R. R. L. and this is being done by four persons.

Q. Is any State doing research work on maple sirup products?

A. No.

Dr. Wells commented that while there is no research work on maple products other than that underway at the E. R. R. L. it is possible that certain aspects of the research problems on maple can be conducted elsewhere through research contract agreements.

WHAT THE EXTENSION SERVICE HAS DONE FOR MAPLE PRODUCERS IN NEW YORK

by

Fred E. Winch, Jr., Cornell University, Ithaca, New York

Maple products in New York have been an important source of income on the farms in the rough lands of the state, since it was settled. There are three general areas of production where the emphasis to this product has been given. These areas are the Central New York Catskills, the Adirondacks, and the Southwestern area. Production in the state varies from 411,000 gallons to 987,000 gallons over the last eighteen years.

The extension foresters in New York have been aware of the need for education in production of maple products, sirup and sugar, for a long time. Schools for maple producers have been held for twenty years. In the early days the discussion centered about such topics as how to tap, that is whether it is better to tap over a large root or under a large limb, or whether the north side of the tree was more or less productive than the south side.

Gradually, the schools built up into a program that was extremely valuable to the producer. As with all extension programs there must be a demand from the field for information. In this case there was a demand from the producers. One of the early questions asked was "Why do I get sugar forming in the can?" or "Does it pay me to tap small maple trees?" When the county agent found that there was a demand in his county for information he scheduled the extension forester into his county to conduct a maple sirup meeting arranged at some central location. Gradually every important maple producing county was scheduling meetings of this kind.

At first these meetings were held in small rooms at the county seat, for only 20 to 25 producers were expected. As time went on, these meetings developed a definite pattern. During this time interest, of course, grew. The mailing lists were built up and new methods of communications developed. Instead of meetings held during the sap season, the dates were changed so that we held "pre-season" schools in January and February. For the most part the meetings are now

"all day" affairs. The county agent has arranged for the courtroom, a grange hall, farm machinery buildings, or school auditorium for the lecture part of the meeting which is supplemented with charts, slides, and a motion picture on maple production. This session is held in the morning. Then, at noon, a sausage and pancake dinner is held at a grange hall, school or church, featuring local sirup, of course, and the meal is put on by a local group. After the lunch the group reconvenes and a panel of experts, usually experienced producers, takes a short time to discuss their problems and then the questions from the floor are submitted, in writing, to the extension forester who acts as moderator.

Later a demonstration of new equipment, such as filters, thermometers, hydrometers, tapping machines, bits, etc., is given and the school adjourns. The school lasts from 10 a.m. to 3 or 3:30 p.m. allowing the producers time to do chores in the morning and dismissing early enough to get back for chores at night.

A typical meeting is started off by a lecture reviewing the economic situation of the maple producers in the state. Prices are given and a review of general maple situation is made with reference to the outlook for the year. Some of the points regarding production methods are reviewed. One example is to tap as follows: hang 1 bucket on trees 10"-14" in diameter; 2 on 15"-19"; 3 on 20"-24"; 4 on 25" and up. The use of the "precision instruments" in sirup production is discussed as are techniques of gathering for labor efficiency. To cap this talk, the new ideas are presented.

After lunch the panel discusses many of the problems in the county. The county agents, with the help of local committees, select the panels and more or less set up the topics for discussion based on problems in the county. Then the new equipment is shown and discussed pro and con, based on the experience of local people.

The secret of the success of the meetings has been the continual re-emphasizing of the essential information presented from year to year, with at least one new topic to be discussed yearly. For example, the past two years the topics were redesigning the saphouse and the use of "indicator" trees as "barometers" to show when to tap. This year the topic to be emphasized will be the marketing of the products. No meeting is a success if the same information is given out and nothing new added to create interest and bait the producers.

In cooperation with the Agricultural Economics Department, a study was carried out on production costs of maple sirup on 20 farms in the state. The results of this study are shown in the table below. From this study many points were brought out on how the efficiency of the operations may be increased to increase earnings.

Cost of Producing Maple Sirup in New York

Item of Cost	Cost per gallon 1935-37	1947	Percent of Total 1935-37	1947
Fixed Costs				
Interest (Building & Equipment)	$ 0.12	0.23	9	6
Depreciation and Repairs	0.20	0.26	16	9
Use of Bush	0.20	0.39	16	14
Insurance		0.02		1
Total	0.52	0.90	41	32
Man labor	0.42	1.24	33	44
Fuel	0.25	0.40	20	14
Horse, Truck or Tractor	0.07	0.29	6	10
Total Production Cost	1.26	2.83	100	100
Marketing Costs	0.14	0.19		
Total Cost at Farm	1.40	3.02		
Average Selling Price	1.50	4.83		
Net Gain	0.10	$ 1.81		
Return per hour for labor		$0.56-$3.78		

Another feature that has been welcomed by the producer has been the fact that the extension forester has been able to bring with him to the meeting examples of new equipment, new packages, filters, and other equipment needed in the field. If the material was not available locally, they could find out where to send for the materials needed. At the larger meetings many equipment dealers would be present to show their wares.

The County Agricultural Agent supplies news articles and radio publicity over all the farm programs in the area to keep the interest high and, depending on the weather, 50 to 300 folks will be present to hear the lecture and participate in the discussions.

In addition to the meetings of the county groups of producers, for many years it has been the custom to have a producers' summer tour. On this tour five to ten outstanding producers from two of the areas will visit the outstanding producers of the other area in the state to see and discuss the year's work. The visits rotate among the three areas. In this way we have spread good practices.

In the line of visual aids, we have an excellent bulletin for use of the producer, Cornell Extension Bulletin No. 397. A companion piece has been the color motion picture "Maple Sirup Production" produced by the Visual Aids Department. A number of slides illustrating the operations in the sugar bush and saphouse have been prepared for limited use as well.

Discussion

Q. Is reaming of the dried tap hole economical?

A. No.

Q. Is the tree damaged if instead of reaming a dried tap hole, a new hole is tapped a little to one side of the dried hole?

A. Yes. The tree is damaged since the amount of dead wood is increased and were this practice to be followed it might cause the tree to die.

Q. Will all of the data given in "Costs and Returns in Producing Maple Sirup" by A. Dewey Bond, Cornell University, A.E.661, be included in the abstracts of the meeting?

A. No, since the publication can be obtained by writing to Mr. Fred E. Winch, Jr., Extension Forester, Cornell University, Ithaca, New York.

BOTANICAL RESEARCH ON MAPLE SAP AT THE UNIVERSITY OF VERMONT

by

James W. Marvin, University of Vermont & State Agricultural College, Burlington, Vt.
(Paper presented by Mary T. Greene)

Object of the research is to better understand the flow mechanism of sap in sugar maple. Insofar as is known, sap flow is always associated with a rise in temperature, so experiments described were performed in a laboratory apparatus that permits control of the temperature. Experimental material was stems from individual sugar maple saplings, collected while frozen. The stems were 4-1/2 feet long, and inch and a half or so in diameter, and weighed about a pound. They were either used immediately or collected in quantity in March and stored at 23° F. Such stored material was usable after as long as four months in storage. In nature, stems collected in Vermont show active flow from about November 15 to leaf emergence. Thus, with the aid of frozen material in storage, experiments on flow could be conducted for nine months of the year. The usual observations were the volume of sap exuded from the stem or the volume of distilled water absorbed by it during a particular treatment.

A comparison was first made of the sap flow from sugar maple and four other hardwoods commonly associated with sugar maples in nature. When frozen and then warmed to 45° F., stems of sugar and striped maples gave a flow, whereas stems of black cherry, American beech and yellow birch absorbed water. It was found for sugar maple that freshly cut stems usually flow at a rapid rate but for a relatively short time (1 to 4 hours) compared to stems held frozen in storage for several weeks (6 to 53 hours). There was no apparent relation between the duration of flow and the total amount of sap produced. It was observed, as groups of stems were thawed and then warmed to 45° or to 85° F., that there was large variability in the time and the temperature at which flow began. Upper and lower sections of the same stem showed analogous variability, sometimes to the extent that one section absorbed water whereas the other exuded sap.

In nature the flow of maple sap occurs during the time of year when the daily temperature range is frequently above and below the freezing point, 32° F., and it is commonly believed that the flow mechanism requires freezing temperatures. Laboratory measurements showed, though, that freezing is not in fact necessary for sap flow. And field observations on a number of trees clearly demonstrated that good flows occurred when the lowest temperature of the wood during the daily cycle was appreciably above 32°. After two or three days above freezing, the wood temperature seemingly must fall below 32° in order that flow may continue.

After a normal flow a group of stems was treated with steam at 1 lb./in.^{2} pressure for two hours. This was considered sufficient to inactivate the living cells. The stems were then allowed to absorb, were frozen and warmed to 45° F. as usual. After the steam treatment no flow occurred, rather, the stems absorbed water. It was thus evident that the activity of living cells is necessary to produce sap flow.

In another group of stems the sap was displaced by distilled water, the stems were frozen and then warmed to 45°. In contrast to the normal flow, all stems absorbed. Thus, replacement of the sap by pure water reversed the direction of the flow mechanism. The water in the same stems w as in turn displaced by freshly collected sap from other trees. After freezing and warming, flow again took place. Experiments were now begun with a sort of synthetic sap, composed of a 5 percent solution of sucrose (ordinary sugar), since this is present in natural sap in much greater amount than any other ingredient except water. The sap in twelve stems was displaced by the sucrose solution, and the stems were frozen and thawed. In all cases flow occurred, and in some stems to a considerable extent. The experiment was repeated with another sugar, mannitol, using a concentration that gives the same osmotic pressure as the vessel sap. Absorption rather than flow took place. Thus, the stems behaved as if they had been treated with distilled water. Experiments are in progress to establish whether sucrose is a specific requirement for the flow mechanism.

In summary, the data show clearly that flows from comparable stems are at best only qualitatively alike. For the present the significance of the experiments is related to the direction of the flow mechanism: whether flow or absorption occurs. Interpretation of quantitative differences awaits more complete understanding of the mechanism of flow.

VARIATIONS IN SUGAR YIELD IN MAPLES IN NATURAL STANDS

by

F. H. Taylor, University of Vermont and State Agricultural College, Burlington, Vt.

The sugar maple, unlike sugar cane and sugar beet, is still a wild plant and not much is known about its natural variability. This paper summarized observations extending over as many as seven years on individual trees and on a number of sugar bushes. The scope was restricted to the percentage sugar and the volume of sap, and thus the total amount of sugar produced. The results should be useful in planning for the establishment of high-yielding stands in favorable locations, propagating high-yielding stock, and in determining whether or not to replace existing trees or sugar bushes.

Seasonal averages in sugar concentration for ten trees in the seven year period 1944-1950 showed that the same tree differs in sugar content from season to season. The ten trees were selected in a uniform manner from a large group. The best tree averaged 5.1% sugar, with a maximum of 7.1% and a minimum of 3.5%. Average rank calculated for the seven year period showed that a sweet tree is a sweet tree year after year. Records for a single tree between 1947 and 1950 revealed the following variability in sugar concentration: 1947, seven observations between April 1 and 14, 3.9 to 4.4% sugar, averaging 4.1%; 1948, seven observations between March 25 and April 18, 3.5 to 4.0%, averaging 3.6%; 1949, twelve observations between March 14 and April 12, 4.0 to 5.8%, averaging 4.4%; 1950, twenty-one observations between March 20 and April 18, 2.3 to 5.1%, averaging 4.0%

Ranking each of twelve trees on ten sap days during the 1950 season it developed that, in respect to sugar concentration, trees maintain their position relative to their neighbors throughout a given season.

Comparison was made of nine sugar bushes, containing individually from about 90 to 800 trees and totaling 3400. It showed considerable variation in sugar concentration within the same season (1944)--for the best bush, from 5.0% in late March to 3.8% in early April, to 3.5% in late April. For the poorest bush (which was only a quarter of a mile away from the best) the respective concentrations were 2.2, 1.9 and 1.7%. The rank of each bush was the same for each of the three periods. Again for the best bush in the group, the average sugar concentration was 4.2% in 1944, 3.2% in 1945, 3.0% in 1946, 3.2% in 1947, 3.1% in 1948 and 1949, and 2.8% in 1950

As with sugar concentration, the same tree was found to differ in yield of sap from season to season, and a good sap tree tends to be a good sap tree year after year. The best of ten trees measured gave 16.6 gallons of sap in 1947, 20.6 gallons in 1948, and 20.3 gallons in 1949. Respective values for the poorest tree were 9.8, 5.5 and 3.4 gallons. Correlation between sap volume and average sugar concentration for a particular tree is poor. Sometimes a sweet tree produces a large volume of sap, and vice versa. The result is that the true worth of a tree as measured by the total amount of sugar it produces can be inferred only by determining both the concentration and the sap volume.

The change in rate of sap flow during the period 9 a.m. to midnight was reported for two trees. On a day when the temperature rose from 32° at 8 a.m. to a maximum of 50° at noon, and then declines to 30° at midnight, the flow from one tree rose from 0.14 pint per hour at 10 a.m. to 2.7 pints per hour at 4 p.m., then fell off almost uniformly to about 0.4 pint per hour at midnight. On another day the temperature changed from 32° at 8 a.m. to 37° from 1 to 6 p.m., and to 35° at midnight. The same tree produced sap at the rate of 0.8 pint per hour at 9 a.m. The rate increased to 2.3 pints per hour at 1 p.m., then decreased uniformly to 0.6 pint per hour at midnight.

In the discussion it was brought out that sugar maples in forest stands are generally poorer producers than are relatively isolated trees of the same diameter. There are as yet no data showing the suspected relationship between sugar yield and the crown size of the tree. Such data are being sought in a cooperative project between the New York and Vermont Stations. Fertilization of a [illegible] acre plot of forest-type sugar maples with commercial fertilizer had no effect on the sugar content of the sap when compared with non-fertilized trees in the adjoining area. No attempt has thus far been made to determine the seasonal and within-season variability in flavor of sirup derived from selected trees.

THE PROPAGATION OF MAPLE STOCK

by

Clark L. Stevens, University of New Hampshire, Durham, N. H.

Propagation by Seed

A good crop of sugar maple seeds is obtained about every third year. If the seeds are stored properly, it is possible to obtain 90% germination. One successful method for over-winter storage is merely to place the seed in sand about 2 feet underground. It is more convenient, however, to plant the seed directly in a rodent-proof seed bed in the fall. The seed are fairly evenly broadcast and covered with about 1/4 inch of soil plus a suitable mulch. The seedlings are grown in the seed bed for two years, after which they are carefully culled and

placed in a transplant bed for two more years. They are culled again and then set out. If they are planted in holes with their roots adequately spread out, about 80% survival might be expected. Up to the present time very little has been done about controlling the pollen necessary for seed fertilization, although there is a possibility that the seed stock might be improved by these means.

Vegetative Propagation

Cuttings--Cuttings commonly are gathered in June, preferably from young twigs. They are planted in a mixture of 2 parts peat and 3 parts sand, are kept covered with moist cheesecloth and are watered daily. Treatment of the cuttings with various growth-promoting chemicals has given no better results than is obtained by water treatment alone. As many as 50% of the cuttings have been successful. The rooted cuttings should sit in place for one year before being set out. If they are set out too soon, a high mortality rate should be expected.

Layering--Although sprouts when covered with soil frequently take root, the number of new plants obtainable by this method is restricted.

Grafting--No successful stock-scion or bud grafts have been made as yet, although the possibility of their success still remains.

Root Cuttings--Up to the present time experiments with root cuttings have given negative results.

Discussion

Q. Are the cuttings covered completely with soil and mulch or only at their bases when they are set out?

A. In the discussion it was revealed that both methods have been successful, although it was felt that the complete covering of the cuttings and a gradual uncovering as they become established was the more desirable method.

Comment: Dr. Schreiner stated that propagation by means of cuttings was a promising method, perhaps even more promising than Dr. Stevens had indicated. The cuttings grow about as rapidly as do the seedlings.

Comment: The gentical variability of the parent stock should not be overlooked in experiments on cuttings. For example, only 17% of the cuttings from one red maple tree rooted, but 98% of the cuttings from a second tree were successful. Usually cuttings should be made from several trees.

Comment: Dr. Robbins, of Michigan State College, stated that his findings on seed germination, grafting, and cuttings confirmed those of Dr. Stevens.

RESEARCH PROGRAM ON MAPLE PRODUCTS AT THE EASTERN REGIONAL RESEARCH LABORATORY

by

C. O. Willits, Eastern Regional Research Laboratory

Under the Research and Marketing Act of 1946 utilization studies on three additional commodities, one of which was maple sirup, were undertaken at this Laboratory. While we all know that maple is one of the oldest of our North American industries, research dealing with it has been limited and falls largely into three periods. In

the earlier research covering a period ending in the late twenties emphasis was placed upon the development of means for the detection of adulteration. Next came work on the cause of lead contamination of maple sirup, and means for its prevention. Current work covers the improvement of maple products, improved methods of production, study of the botanical factors causing sap flow, and propagation of high yielding maple trees. Throughout these periods there has been a limited but continuous research program conducted at the Universities of Vermont, Laval, and Montreal, under the direction of such men as C. H. Jones, Elphage Bois, and J. F. Snell.

The current research program of the Eastern Regional Research Laboratory is directed toward improvement of the quality of maple sirup, development of improved methods of production and processing, and development of new and extended uses of maple products.

When an appraisal of the gross constituents of maple sirup are made it becomes apparent that the only constituent of real value is that comprising maple flavor. Any research on the improvement of maple sirup will have to be based upon a complete knowledge of the flavor. This will necessitate a fundamental research program which it is hoped will supply answers to such questions as: What is maple flavor? Where does it come from? Does it exist in sap as such or is it formed from substances in sap? How is it affected by heat and light? How is it influenced by other constituents of maple sap?

In pursuing such a fundamental research program many practical problems developed which required attention. Among these were: What can be done to darken light colored sirups to meet trade demands for a sirup with a color of grade B or C? This was an important problem in years such as 1947 and 1950 when a major portion of the crop was of grade A or Fancy. Other problems involve development of more satisfactory farm methods of sirup filtration, means of controlling "finished" sirup, the best packaging procedure, and a simple chemical test for invert sugar in sirups used on the farm for making confections.

Two such practical problems have already been studied and the work completed. One was the development of permanent glass color standards for use in grading maple sirup. This work will be discussed by Dr. Brice. The other problem was the development of a process which would not only darken the ordinary maple sirups of commerce, but impart to them a strength of flavor four to six times that of the original sirup. This development came about through the fundamental studies on maple flavor.

It had been noted that very little change in color occurred when a light colored sirup was heated at temperatures below 190° F. and that sterile sap was both colorless and flavorless. These facts, supplemented by the observations of others, led us to formulate the theory that maple flavor is due to a browning or Maillard reaction; a reaction between such pairs of organic compounds as amino acids and simple reducing sugars or organic acids and amino acids, which are constituents of maple sap. If this is the mechanism involved then it should be possible to develop more color (browning) and more flavor merely through the use of higher temperatures than those used in sirup making. Processing maple sirup at the optimum temperature and holding time, the amount of flavor developed would be limited only by the amounts of the reacting substances present. From analytical data it can be assumed that at least one of these reactants is present in the amount of less than 0.1%. Since the conditions for maximum flavor development also favor the formation of caramel and other off flavors, it is conceivable that these reactions are in competition with those of maple flavor. Under the proper conditions these reactions will exceed the rate of maple flavor development. This would be especially true if the maximum amount of flavor has been developed (reactants consumed) and the other flavors

continue to be formed. In such a case the maple flavor could be completely masked. It can thus be seen that to develop maximum maple flavor the starting sirup should be one of the light grades of sirup since they are essentially free of caramel and other flavors.

Maple flavor is an intangible quantity and so far it can be identified and evaluated only by taste. It is almost impossible to evaluate the flavor in our high-flavored sirup because of its intensity. This is not uncommon since a similar situation exists with many flavors, for example the flavor of a vanilla concentrate is intolerable. To obtain a true value of the flavor the sirup must be diluted back to the flavor level of ordinary maple sirup through the use of a flavorless medium such as cane sugar sirup. The amount of such dilution (blending) to produce a flavor similar to that of the original maple sirup gives a measure of the quantity of the flavor developed.

In the work here it became necessary to evaluate the quality of the sirup blends made from the different high-flavored sirups. To do this a simple taste testing procedure was developed based upon paired samples. This test did not yield an absolute value for flavor quality or flavor level, but it did provide the means for making comparisons and the establishment of tasters' preference.

The test is quite simple, does not require a trained panel, and more important, does not require the taster to memorize the flavors of all of the samples so that comparisons can be made. The samples are coded, A, B, C, D, etc., but no more than 4 sirups should be tasted at one time since by the time the 6 possible pairs, AB, AC, AD, BC, BD, and CD, are tasted the taste buds are so fatigued that they can no longer make sharp distinctions. The taster tastes one of the six pairs and scores his observation for that pair before tasting the next pair. A mark, +1 is given the sample which is distinguishably better than the other sample; a mark, +2 for a sample that has a much better flavor than the others; and a mark, +1/2 for each sample of the pair if their flavors are identical. The score is based entirely upon preference and it is independent of the presence or lack of maple flavor. After all pairs of the set have been scored, the score for each taster is compiled. For example, the scoring of four sirups where A was very much better than B, B better than C, and C and D were equal:

	SAMPLES			
Pairs	A	B	C	D
AB	2+			
AC	2+			
AD	2+			
BC		1+		
BD		1+		
CD			1/2+	1/2+
Total	6+	2+	1/2+	1/2+

In panel testing of sirups the final score is the total obtained by addition of the individual scores. As noted earlier the tasters are requested to indicate which sirup is most maple-like. In our work here we have found that the sirup in a group identified as maple sirup often is not the tasters first choice as shown by his score. The answer to this is quite simple. His identification of pure maple is largely one of previous training and experience. Thus a taster who has known maple only through commercial blends will identify such a blend as pure maple but likely

will score it below pure maple or other blends. We are fortunate here at this Laboratory to have our taste panel made up of people who are not familiar with true "maple" and so they are very helpful in showing consumer preference for the sirup tested. We have found that the panel is divided into two groups, with one preferring pure sirup and the other preferring blended sirups. This could only be based upon the fact that the latter group did not care for the sugar sand flavor unless it was diluted as is the case in the sirup blends.

In grading of maple sirup one of the elements considered is its density. There are a number of ways in which this can be measured, the most common being the use of the hydrometer. Unfortunately, considerable confusion developed in the maple industry because of the several hydrometer scales in use. The late Professor Cope in writing a letter to an instrument manufacturer seeking information as to why they offer 4 different maple sirup hydrometers, expressed his confusion by signing his letter, "In a fog. J. A. Cope."

The scales of maple sirup hydrometers are either in degrees Brix, percent sugar, or Baumé. The latter is perhaps the chief cause of the confusion, since unlike the Brix scale which expresses the percent solid as percent sucrose, the Baumé scale is an arbitrary one which must be translated into percent sugar solids through use of appropriate tables. Further, there have been no less than three different Baumé scales for sugar solutions and to make matters even worse, separate Baumé hydrometers have been made with scales based upon calibrations at 60° and at 68° F. We also find maple sirup hydrometers with both Brix and Baumé scales. This, of course, requires a larger spindle stem and consequently the graduations are less open than those of other maple sirup hydrometers.

The Baumé scale has enjoyed commercial acceptance for almost two centuries. This scale was put on a scientific basis when it was calculated from the specific gravity of the solution by use of the following equation, $Bé^{\circ} = m - m/sp.g.$, where m is known as the modulus. In sugar work the "new" or Gerlach scale has been largely used. This has a modulus of 146.8. In the United States all manufacturers of hydrometers use the Bureau of Standards modulus of 145 in making their scales. It could well be that when the first maple sirup density specifications were drawn up, the density (pounds per gallon) was interpreted in terms of the Gerlach Baumé scale (m = 146.8), in which case 36° Bé would equal a sirup of 11 pounds per gallon at 20° C. having specific gravity of 1.32171. Unfortunately, the Bé hydrometers for sale in the U. S. have scales based on a modulus of 145. On such a scale the correct density of standard sirup at 20° C. (68° F.) is 35.27° Bé. If the Bé scale with m = 145 is standardized for use at 60° F., as in Vermont, then the scale reading for standard sirup will be 36. It has been argued that an easy solution would be to drop the Bé scale.

Although New York has done this and adopted the Brix Scale hydrometer, the other scales are still in use in the maple industry. Since this situation is with us, the only alternative is to use the scales but to exercise care in the interpretation of results, for indiscriminate use of them will only add to the confusion.

MAPLE FLAVOR STUDIES. A PROGRESS REPORT

by
W. L. Porter, Eastern Regional Research Laboratory

The production of an essentially colorless and flavorless sirup from maple sap by vacuum concentration at low temperatures verified the results of Findlay and Snell which indicated that maple sap does not contain color and flavor. Use of freeze-drying to produce a sirup from sterile maple sap which was completely colorless and flavorless was further proof of the observation. This latter sirup, when heated at 212° F. for a short time developed the characteristic flavor and some color. These facts led us to the hypothesis that maple flavor is the result of a browning (Maillard) reaction which occurs during the evaporation process in the usual production methods. The production of a synthetic maple flavor by Barnes and Kauffman from alpha-amino butyric acid and glucose was further substantiation of this hypothesis.

In order to study flavor, which probably occurs only in trace quantities, we felt it would be necessary to first investigate each of the individual groups of compounds which are known to undergo browning. Accordingly, we are applying ion-exchange techniques to separate the constituents into three main groups, namely, amino acids and inorganic cations (basic fraction from cation exchanger), organic and inorganic acids (acid fraction from anion exchanger) and the carbohydrates (neutral fraction which is not adsorbed by either exchanger). We plan to mix these fractions in the three possible combinations (amino acids-organic acids, amino acids-carbohydrates and organic acids-carbohydrates) and heat them under certain empirical conditions to discover which of the materials enter into the reaction.

In the meantime, we are making fundamental studies on the composition of each of the fractions in order to facilitate later work on the identification of the individual components of each fraction which may enter into the reaction. In addition, these studies may lead to a possible test for adulteration if one or more constituents can be found which is relatively constant in concentration from sample to sample.

The composition studies are being performed by a technique termed chromatography. Two types of chromatography are available (1) adsorption chromatography, where materials are withdrawn from a solution on to the surface of a solid by means of difference in charge, etc.; and (2) partition chromatography in which a solvent (water) is held as a stationary phase by means of an inactive solid through which flows a mobile phase of a solvent immiscible with the other solvent. As the mobile solvent passes through the stationary solvent a series of partitions occur giving separation according to the relative solubilities of the compounds in a mixture. The materials which are most soluble in the mobile phase move through the column more rapidly than those which are relatively more soluble in the stationary phase.

At present we are studying the acid fraction and are using paper chromatography in which the water phase is held on a sheet of filter paper and the organic solvent passes through. The position of the organic acid is demonstrated by spraying with an acid-base indicator. The acids are identified by means of their R_F values.

$$R_F = \frac{\text{distance moved by spot}}{\text{distance moved by mobile solvent front}}$$

These values are constant for each acid and can be determined by use of known compounds. By means of this technique we have demonstrated the presence of at least eleven organic acids of which five have been identified as citric, malic, glycolic, succinic and fumaric acids.

In order to identify the others we are using columnar partition chromatography using silicic acid as the support for the stationary phase. This was demonstrated during the tour of the laboratory.

Later work will include fundamental composition studies of the amino acid and carbohydrate fractions as well as studies on the identity of other organic materials, such as aldehydes, ketones, etc., which may be present in maple sap and maple sirup.

DEVELOPMENT OF PERMANENT GLASS COLOR STANDARDS FOR MAPLE SIRUP

by

B. A. Brice, Eastern Regional Research Laboratory

The U. S. Department of Agriculture's color standards for maple sirup issued in 1940, are designated "Light Amber", "Medium Amber", and "Dark Amber". Until recently they were represented by solutions of caramel in glycerin, made up in accordance with spectrophotometric specifications of R. T. Balch (1930). These specifications refer to the per cent transmittance at wave-length 560 mμ in a 1 cm. cell, compared with glycerin in an equal cell, and are: 75.0% for Light Amber, 60.5% for Medium Amber, and 44.0% for Dark Amber. Although such solutions are excellent color matches for maple sirup, they fade slowly and have to be replaced each year. If faded standards are used, the result will be to erroneously grade downward a certain proportion of sirups.

The problem of developing permanent glass color standards was brought to our attention by the Production and Marketing Administration and by the New York Department of Agriculture and Markets. The problem was not to establish new standards but simply to duplicate the existing standards in glass.

A square 2-ounce bottle having an inside thickness of 1.24 inch (31.5 mm.) was adopted as a container for sirup samples to be graded. Adoption of this bottle and redesign of the viewing box (comparator) resulted in a number of features which make grading easier and more precise: (1) The square shape provides a field of view of uniform thickness and uniform color, a feature not provided by the cylindrical containers previously used; (2) the greater thickness of sirup viewed results in a wider spacing of the standards on a color scale; (3) variations in internal thickness from bottle to bottle are less important than if a smaller bottle were used; and (4) the square shape and larger bottle permit closer spacing of sample and standard, and present a larger field of view.

By means of the spectrophotometer and the I. C. I. color coordinate system, inexpensive commercial amber glasses were located which had the required color characteristics. When ground and polished to the proper thicknesses their colors duplicated closely the colors of the caramel-glycerin standards solutions in depths of 31.5 mm.

The new comparator or viewing box is a black all-metal box divided by thin partitions into five square compartments, each of which has square windows for viewing. The glass color standards are mounted permanently against the front windows of compartments 1, 3 and 5. Three square bottles filled with clear glycerin-water solutions are placed behind the glass standards to make the standards look like filled bottles of sirup. A bottle containing sirup to be graded is placed in either compartment 2 or 4 so that it will be between adjacent standards. To assist in the grading of cloudy sirups, three square bottles containing cloudy suspensions in glycerin-water are provided. These suspensions correspond to the limits of cloudiness permitted in the different grade classifications for table maple sirup.

The complete grading set, as illustrated here and as described in our publication AIC-260 (Feb. 1950), is now commercially available. The present cost, less than eight dollars, is reasonable when it is considered that the colors of the standards are permanent; each piece of glass is tested by the Department before turning it over to the manufacturer of the grading sets, and again after it has been ground and polished, and is therefore closely standardized; and finally, grading for color can be done more easily and more accurately than heretofore. The new sets were first placed in use for the 1950 maple season. About 230 sets are in use by inspection services, processors, buyers, and producers.

ENGINEERING RESEARCH PROGRAM

by

E. L. Griffin, Jr., Eastern Regional Research Laboratory

The function of the chemical engineering group at the Eastern Regional Research Laboratory is to determine the means and investigate the feasibility of carrying out chemical processes at reasonable costs in commercially practicable equipment. This is done by experiments and pilot-plant tests using equipment constructed of commercial materials and so designed and instrumented that engineering data can be obtained. The chemical behavior of the products being processed must of course be known before pilot-plant tests can be made; we usually depend on the chemists working on the same project to give us this information. The principal problem has hitherto been understood to be the development of good flavor in the sirup without undue darkening. In the maple industry the scale of usual commercial operation is so small that our pilot-plant apparatus can actually be of commercial type.

Investigations were made to discover the existence of volatile maple flavor in sap or sirup, in the hope that any flavor lost during evaporation might be recovered. This work was done using the Eastern Regional Research Laboratory apple flavor recovery equipment, which functions by evaporating off a controlled fraction of the juice in a few seconds time and then concentrating the vaporized part in a fractionating column. Test runs on fresh sap and on diluted high grade maple sirup produced only very little flavor and it was not of a true maple character. Tentatively, we believe the typical maple flavor has too low a volatility to be actually evaporated from sap or sirup; the maple odor around a sugar house may be fine spray carried by the steam.

We plan to study the concentration of good sap and filtration of sirup. Obtaining uniform sap for comparative studies of different methods of evaporating will

be a problem. The first work will be on conventional evaporators. Due to the short operating season expensive equipment cannot be justified and must be avoided. A small conventional evaporator will be installed in our pilot wing and studied with the basic aims of color and flavor improvement and making operation more convenient and certain. It may be possible to improve the design so that a continuous drawoff is more easily obtainable. The sort of automatic controls generally used in the chemical industry would be far too expensive.

Seven commercial evaporators of various makes and sizes were examined in operation. This study will be extended as far as possible next season. Study of variously arranged evaporators operated in different manners will help us to understand the problems. Since the variables involved are numerous, a large number of evaporators must be examined to obtain significant results.

MAPLE PRODUCTS CONFERENCE

Eastern Regional Research Laboratory

November 13-15, 1950

LIST OF ATTENDANCE

Name	Organization	Address
Anderson, Parker O.	University of Minnesota	St. Paul 1, Minn.
Ayres, Fairfax	Fernpoint Farm	Shaftsbury, Vermont
Banks, Wayne	Northeastern Forest Exp. Station	Upper Darby, Pa.
Bissell, Lewis P.	University of Maine	Orono, Maine
Boldue, Mendosa	A. E. Poloue & Son	Lewiston, Maine
Bostwick, Elmer P.	Production & Marketing Adm., USDA	Washington 25, D. C.
Brauble, W. C.	Agricultural Experiment Station	State College, Pa.
Brice, B. A.	Eastern Regional Research Lab.	Philadelphia 18, Pa.
Briggs, Anthony R.	---	Buzzards Bay, Mass.
Buch, Margaret L.	Eastern Regional Research Lab.	Philadelphia 18, Pa.
Burgess, Hovey	General Foods Corporation	Hoboken, New Jersey
Calkins, C. F.	National Assoc. of Chain Drug Stores	New York, New York
Callward, Floyd M.	Agricultural Experiment Station	Storrs, Conn.
Chapman, Ross A.	Dept. National Health & Welfare	Ottawa, Canada
Conklin, Hugh R.	General Foods Corporation	Hoboken, New Jersey
Conlin, Augustus	Cary Maple Sugar Company, Inc.	St. Johnsburg, Vt.
Coombs, R. G.	---	Jacksonville, Vt.
Coombs, R. G., Jr.	---	Jacksonville, Vt.
Davidson, A. A.	---	Cooperstown, N. Y.
Dwinell, H. A.	Department of Agriculture	Montpelier, Vt.
Elder, L. W.	General Foods Corporation	Hoboken, New Jersey
Esselen, Wm. B., Jr.	Agricultural Experiment Station	Amherst, Mass.
Fitch, E. Clyde	Vermont State Farm Bureau	Calais, Vermont
Flaherty, Geo. V.	Lily-Tulip Cup Corp.	Philadelphia, Pa.
Foulds, Ray	University of Vermont	Burlington, Vt.
Gay, Paul B.	New Hampshire Maple Producers Assn.	New London, N. H.
Green, Mary T.	University of Vermont	Burlington, Vt.
Gribben, Owen	General Foods Corporation	Hoboken, New Jersey
Griffin, E. L., Jr.	Eastern Regional Research Lab.	Philadelphia 18, Pa.
Holbert, S. A.	Holbert Brothers	Onamia, Minnesota
Horn, I.	General Foods Corporation	New York, New York
Hubbel, Charles R.	Willow Brook Farm	Jefferson, New York
Huntable, R. B.	Sugar Bush Supplies Company	Lansing 4, Mich.
Jenne, Frank L.	American Maple Products	Newport, Vermont
Jones, R. D.	U. S. Forest Service	Philadelphia, Pa.
Knock, D. B.	Penick & Ford, Ltd.	New York 17, N. Y.
Landry, C. E.	Les Producteurs de Sucre D'Erable de Quebec	Quebec, Canada
Lemke, H.	Minnesota Forest Service	Cambridge, Minn.
Lindert, D.	American Maple Products Co.	Newport, Vermont
Lind, J. H., Jr.	Penick and Ford, Ltd.	New York 17, N. Y.
Lothrop, Rex E.	Eastern Regional Research Lab.	Philadelphia 18, Pa.
Lyon, Clement A.	Bureau of Markets, Dept. of Agric.	Concord, N. H.
Macdonald, E. R.	United Maple Products Ltd.	Grandby, Quebec
Maheux, George	Department of Agriculture	Quebec, Canada

Name	Organization	Address
Maroney, R. H.	Vermont Evaporator Company	Ogdensburg, N. Y.
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